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American Railroad Journal.

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HIGH-SPEED FREIGHT TRANSPORTATION.

BY S. H. FINCH.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE present time may not be most opportune for proposing innovations and experimental enterprises to the trunk lines of this country, but it may be a time to suggest the necessity for introducing a system of freight movement, the character of which will be indicated and a very brief discussion of general features offered for the consideration of railway managers, although the writer presented the subject to two roads running between New York and Chicago, more than two years ago.

Concerning the introduction of the above service between New York and Chicago, or cities west of Chicago, it may be stated, that the freight transported or transhipped between the larger cities of the country by rail, is handled by one of the three following methods:

1. By ordinary freight-train service.
2. By the so-called fast-freight lines.
3. By the express companies.

The first carries the coarser and more bulky articles, in the delivery of which time is of little or no consideration, the average time being from seven to ten days in moving one thousand miles. In the second, some effort or "exhibition of effort," is made to secure a more rapid movement, and freight is in this way moved one thousand miles in from three to four days. By the third system, which has grown to an enormous business—enormous in more respects than bulk of goods shipped—greater expedition is secured, and express freight is forwarded a thousand miles in about one and one-half days, or but slightly less than thirty miles per hour, including frequent stops at intermediate cities and towns.

The proposed service contemplates no higher rate of speed than this, but much higher than by the fast-freight lines, at least much greater expedition, and while making about the same time as express freight during transit, would differ from the methods involved in the transaction of express companies' business, inasmuch as it is not proposed to collect or deliver any freight whatever—that is to say, no cartage would be performed—but the service would be conducted and considered as some advance on the existing so-called fast-freight lines.

From the foregoing it is obvious that heavy and bulky articles could be forwarded at much greater speed than by the usual freight dispatch, at some greater cost it may be, but the advantages of rapid movement and absence of delay or detention while on the road would make the service of so much more value to inter-State commerce as to compensate fully for whatever additional charge might be necessary to cover the increased cost.

In other words there can be no question but that a middle ground exists between the methods, cost and time of forwarding merchandise by the fast-freight lines, and the facilities offered by the express companies; which is comprehended in the methods here proposed, and which consists in running special freight-trains daily with a limited number of cars at about passenger-train speed, while merchants and shippers provide cartage.

During the past two years many merchants and freight-forwarding agents have been asked for opinions and views regarding the proposed transportation, and they have been unanimous in favor of its introduction. Dealers in fresh fruits have stated in writing that their business would be largely increased, in fact enabling them to reach territory which under existing circumstances affords them no trade whatever.

It goes without saying that the rates charged by the various transportation companies are constantly changing and varying through wide limits, but for present purposes it will be sufficient to mention for comparison what is charged for freight between New York and Chicago.

First-class express freight, $2.50 per cwt.; first-class fast-freight, 60 cts, per cwt.; proposed high-speed system freight, $1.50 per cwt,

It is known that considerable freight can be secured at the rate mentioned, if the time may be depended upon. The actual cost to any well appointed railway would not exceed eighty cents per train mile; for hauling from 50 to 80 tons of freight at 30 miles per hour, while at only $1.00 per cwt., 50 tons would pay $1.00 per train mile.

It has been urged that it was a novelty and that it was impracticable and inexpedient, etc. Now to this it need only be said that there is nothing novel or difficult in practice involved in the introduction of a high-speed freight service between the principal cities. There certainly obtains no difficulty in the actual running of such trains, and no considerable financial efforts or obligations are required. The most serious objection, however, has been that it would interfere and be in conflict with existing contracts between the railways and express companies.

Now while it may so appear to the manager of the express company running over any given road, and in one instance it did so seem, it is maintained that the objection was not well taken, as the methods and business would differ very materially, as would also the class of freight which would be handled. The express business is a "package" business, and implies the collection and delivery of all freight and the transmission of money and valuables, and this business could not be secured or transacted by the system of freight movement suggested.

The proposed service differs in only one feature from ordinary freight transportation, and t [illegible] consists in a higher rate of speed during transit, or what might be quite as true, greater expedition, which means no side-tracking

or transferring. What is required are not more engines and cars of greater power and capacity, more tracks and yards for making up trains, but more movement expedition. If the premises are correct, it will then be advantageous to undertake a new service that will at once increase daily receipts.

It will be expedient to provide for the business requirements of shippers who have goods that can only be profitably handled in the manner proposed, and which are not at present offered to existing transportation agencies, because too much time is required if shipped by the so-called fast-freight lines, and because it cannot pay express charges or be handled by the regular express companies.

The total through shipments east from Chicago for successive months, since 1878 have been in tons:

	1879	1880	1881	1882	1883	1884
January	192,512	163,378	263,872	321,148	257,093	208,060
February	193,541	161,541	204,331	225,313	223,212	170,077
March	258,458	318,883	212,021	179,145	308,354	258,479
April	298,043	136,543	275,417	138,472	147,129	339,312
May	230,355	125,157	171,432	115,772	141,011	266,757
June	260,234	233,977	242,463	115,305	123,339	219,181
July	145,738	130,187	259,253	95,039	113,575	128,061
August	162,263	169,314	260,608	138,241	165,168	140,635
September	134,141	151,464	265,414	153,234	191,977	130,162
October	193,976	179,463	258,374	152,871	123,344	180,899
November	168,274	219,840	216,506	214,295	232,713	199,354
December	179,154	244,790	259,326	225,406	228,520	187,474
Total	2,406,689	2,334,537	2,889,017	2,074,241	2,255,435	2,388,451

Of this large tonnage, the percentage that might possibly be diverted from the regular freight lines would be insignificant so far as mere weight is concerned, but the many instances of vexatious delay and losses incident would make a much more substantial showing if the data were available; but this is by no means the most significant feature, as in many cases an entirely new business would be created. Especially is this true of the fresh fruit and oyster trades, in which but little or nothing is now being done, the dealers in these commodities feeling assured that they can do a business that will be measured by car-loads, profitably at and beyond Chicago, by the introduction of this service, and pay for transportation the maximum rates proposed.

This belief is occasionally substantiated by actual practice during the Summer months by what are called "berry" trains, which are run by several roads leading from fruit-growing regions to the large cities, being run as special trains for the fruit growers, and at much higher speed than ordinary freight-trains, and having practically the same rights as passenger-trains. They have been run at a profit to the roads, and afford the only means by which the fruit growers could successfully dispose of their produce.

Some special arrangements are being made for the garden farmers of Long Island to bring their products to market, and it is quite within limits to suppose that a daily train might be made profitable to the railway and quite satisfactory to consumers, having as its principal object the bringing of vegetables and fruits from the gardens in the Southern States to Northern cities; incidentally mail or passenger cars could be attached to the same train.

It is not however proposed or necessary to discuss the details connected with the management and operating of such a service; they are too simple and obvious. It is only contemplated to maintain the general proposition—abundant evidence having been secured to warrant the conclusion—that a more rapid and expeditious movement of freight is desirable, and that the tendency of all commercial transactions which are affected by transportation, is in the direction indicated.

In addition to the increase of speed implying great saving of time, there is a no less important feature connected with the proposed high-speed service which commends it to the merchant and freight-forwarding agents, which is the element of certainty as to time at which any given lot of merchandise may be delivered; and which is determined by previously prepared time schedules, making the transit and arrival at destination with an equal degree of certainty to that maintained in the transmission of the United States mails; in which case goods may be purchased or ordered by telegraph for "time" delivery with confidence, and many sales thus secured at distant cities that are now lost in consequence of the uncertainty involved in time of transport and arrival if the usual freight service is employed.

PASSENGER-TRAIN CONDUCTORS.

BY A SUPERINTENDENT.

[Written for the AMERICAN RAILROAD JOURNAL.]

UPON reading a recent contribution to the JOURNAL on the subject of "Primitive Railway Service," I was forcibly reminded of the great improvements that have been made during the past twenty years in the minor branches of the service. I mean in the character and general bearing of train-hands—conductors, baggagemen and brakemen. In the early days of railways the qualifications for these positions were not of a very high character. A conductor must be honest and to a certain degree intelligent, a brakeman active and alert, and a baggageman lusty. I doubt if other qualifications were deemed of much account. But time has changed all that, and to-day the average conductor of a passenger-train upon one of our main lines, possesses not only the qualifications of honesty and a limited degree of intelligence, but is a man of good appearance, courteous manners and considerable education. Of course there are exceptions to this rule, but the well-managed road can be distinguished by this class of conductors, and its brakemen and baggagemen are not far behind.

The perfection of train service has been a slow growth, but it is mainly attributable to the development of railway discipline and the semi-military rules that have prevailed. Without doubt the uniforming of railway train-hands has done much toward encouraging an *esprit de corps* among them and improving their general appearance; but there has also been a manifest improvement in the class of men who have applied for and have been appointed to such positions. Every period of financial depression has thrown a number of intelligent and superior men out of employment, and through one influence or another many have secured positions as train-hands upon railways, intending to abandon the pursuit and return to their former occupations when a chance presented itself; but I have observed that the cases are rare when they carry out this intention. Whether there is a peculiar charm about a life upon the rail, or whether the new hand finds

that the position of conductor is one more congenial to the tastes of a man of good attainments or not, I cannot say; but certain it is that the class of men applying for such positions is far superior to what it once was, and every year improves it.

Nor upon reflection does it seem singular that such positions, especially that of conductor, should be sought by intelligent and well-informed men. The responsibilities resting upon, and the capability required in the conductor of a passenger-train are certainly equal to those of a captain of a river or harbor steamboat, and the personal contact with passengers being greater in the former case than in the latter, courteous manners become of greater importance. Good judgment, decision and force are among the essential qualities of a good conductor, and united with the other qualities above enumerated, it is evident that they can only be found among a superior class of men. There is nothing servile in the position of conductor, and he possesses equal authority and importance with the steamboat captain. To my mind there is no question but that a conductor has a far pleasanter and more dignified calling than the ordinary clerk who is tied down to a desk with microscopic chances of bettering his position.

I have said that the well-managed road is particular as to the character of its train-service, but this particularity manifests itself in various ways. Many roads man their trains with men who have risen from lower positions and encourage promotion among train-hands, and this is all very well as far as it goes, but sometimes it works mischief. I can call to mind one road where this "civil service reform" system is in force, and where a more universally unpleasant corps of conductors is not to be found. Strict attention to business, intelligence and capability have been the stepping-stones on this road, and the conductors are certainly reliable men and alert to their actual duties; but it is in those particular and minor branches of conductorship lying without the rigid line of duty that they are singularly deficient. Courtesy to passengers is entirely overlooked, and more than one patron of the road has forsaken it on account of the bearish treatment he has received. A complaint once made to the superintendent of the road regarding the rudeness of a certain conductor, elicited a reply that "the conductor has been with us for twenty-five years, and has risen from the ranks. He may be a little gruff, but he is a most reliable man, and we could not think of dismissing him for such a trifling cause." In cases where promotion is made strictly from the ranks, it is highly likely that reliability will be purchased at the price of courteous address and obliging disposition.

Every road has its rules and regulations which conductors are supposed to observe with rigor, but I hold him a very poor conductor who interprets a *rigorous* observance as an *implicit* observance. Nor do I think that railway management which demands an *implicit* observance a wise one. A conductor should be an intelligent man and being so, to a limited extent, he should be given discretionary powers. It is very well to issue a general order that fare must be collected from all passengers who have not tickets, and in default of payment they must be ejected, but what would be thought of a conductor who ejected a woman who having lost her ticket was also without the means of paying the necessary fare? Ejecting passengers from trains is a delicate matter, and should call for judgment; but an intelligent man can readily detect an attempt to "beat" the road and also a genuine case of distress, and in such cases he should be given discretionary powers. One of the best conductors on my road, if not the best, has been recently promoted to a department of management where he is giving great satisfaction, and this promotion was primarily due to a little incident that came uuder my notice when he had been "conducting" for a few days only. I sat in an ordinary passenger-car when he came through to collect tickets, and I was unknown to him. Immediately in front of me was a poor but respectable woman who was searching for her pocket-book in a manner unmistakably and genuinely agitated. Suddenly she gave a start and exclaimed, "My purse has been stolen," and her agitation took the form almost of terror. I leaned over the seat and spoke to her, expressing the hope that her loss had not been a great one. "No," she answered, "but my ticket was in it and I have no money to pay my fare." My first impulse was to proffer assistance, but the thought occurred to me that I would observe the treatment of the case by the conductor before taking a hand in it myself. The conductor approached her for her ticket, and in manifest distress she explained her predicament to him. He listened politely, and at the conclusion of the brief narrative, looked at her closely for a moment, and then took out his book of rebate slips which State laws generally require to be used in every case where fare is collected on the cars. He punched one and handed it to her. "The rules of the road will not allow me to pass you free, madam," he remarked, "but I will advance the fare and you may return it to me when you reach home. You will find my address on this card." The woman was very grateful, and it is almost needless to say that the conductor had his money returned; but better than all he had shown himself to be a conductor far above the average in courtesy and discretion, and from that moment his advancement was determined upon, if he showed the other necessary qualifications, which he did.

I would not care much for a conductor who set the rules of his road upon a pinnacle and worshipped them as infallible. They are made to be observed, but there are no rules of any kind that can be observed on any and all occasions. In fact to judge of the merits of a conductor I would rather judge of him by the circumstances of his infringement of the rules than by his observance thereof, for courtesy and discretion—two essentials in a conductor—are severely tested in the former case.

I believe in the efficacy of a handsome uniform, both as a means of inculcating discipline and also as an incentive to neatness and general care of personal appearance. I also believe in having good-looking conductors as far as possible, just as I believe in handsome cars; they please the eye. Honesty is the first requirement, and it has been my experience that it is not so scarce a commodity as generally supposed, especially with conductors. Ability and intelligence rank second in importance; but all of the foregoing requisites are of little avail if a conductor be a surly, disobliging fellow, and without sufficient discretion to know when he may "suspend the rules" without fear of censure from his superiors. To obtain this combination of character in a conductor it is evident

that superior men must be employed, and it is worthy of note that upon this principle the leading roads are now acting. Not only are the salaries of such positions as a rule adequate and liberal, but the conductors are treated as employés to whose discretion the company relies to a considerable extent.

LUBRICATING WITH GREASE.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

EVERY now and then some people who are running machinery conceive the erroneous idea, or are talked into it by interested parties, that it would be a greater saving to lubricate all their machinery with grease in preference to oil. This is as erroneous as if we were to attempt wearing a heavy Winter coat through all the seasons of the year—it would certainly answer the purpose of clothing, but only to our discomfort, and only when we can afford no better.

If the bearings of all our machinery were constructed alike for the proper application of grease as lubricant, and the grease were of such character as to melt freely and spread rapidly over the whole surface of the bearings and cling there tenaceously until it has fulfilled its vocation, there would certainly be the advantage gained of not being obliged to attend to the applying of lubricants as frequently as has to be done when using liquid lubricants. Unless the grease possesses the before-mentioned characteristics and can retain a uniform consistency through changing weather, it will be so stiff and solid in the cups in cold weather and in places exposed to changes of temperature, that considerable heating of the bearings would first have to take place before the grease would become liquefied enough to resume its work. We lubricate to prevent heating, and to depend on heating to create lubrication, is certainly erroneous.

A large amount of grease is made up without the slightest knowledge or regard of the theory of lubricating or the adaptation of the ingredients used, and irregularities of feeding through clogging of the appertures are more likely to occur and cause trouble when lubricating with such grease than when lubricating with oil, if it is clear and limpid.

Grease represents lubricating matter in a solid state, and should therefore also represent its lubricating properties in a concentrated state if expected to do lubricating with efficiency proportionate to that of fluid lubricants. Most of the greases, however, are manufactured mainly for gain, contain very little fatty matter, and that of poor quality, are compounded without skill, and suit the spirit of competition on the basis of greed on the part of the seller and false economy on the part of the buyer.

For lubricating purposes we have pure, fatty matter in a solid state only in animal fat, and there only in the form of tallow, lard not retaining solidity enough at slight rising of the temperature. In vegetable fatty matters we have only palm-butter, which like lard, liquefies, and all other fatty matter applicable to lubricating that could be mentioned as in solid or semi-solid state, are so high-priced or of so limited a supply that their practical use for lubricating purposes is out of the question during the present rage to adulterate everything and the clamor for cheap goods regardless of inefficiency and indirect injury. Paraffine-wax secured from the so-called mineral oils, and stearine obtained from various sources, would both compare favorably with tallow as to solidity but are both of very brittle character.

The oils of animal or vegetable origin, lard-oil, tallow-oil, marrow-oil, fish-oils, olive-oil, palm-oil, castor-oil, cottonseed-oil, rape-oil, linseed-oil, resin-oil, etc., and the mineral oils, which are all more or less used in the manufacture of solid-lubricants (grease), can only be brought into that state by compounding with solid resinous or waxy matter or by partial saponification with alkali or lime and admixture of inert matter.

Tallow, therefore, appears to be the only pure grease that maintains a nearly uniform solidity at all temperatures to which grease is exposed in ordinary handling for lubricating purposes, and it is largely used both as fresh suet and in the refined state, when a solid lubricant is better applicable and preferred to oil.

There is, however, great objection to the use of tallow even in its refined state, as under the slow decomposition which takes place under the influence of frictional heat, and even by long exposure to the atmosphere, the fatty acids are set free, and slowly and almost inperceptibly act destructively on the metal. Tallow requires also a high degree of temperature to become sufficiently liquefied before it is able to spread over the entire surface of the parts under frictional motion, and these parts are therefore compelled to accumulate so much of the frictional heat produced by the motion as is necessary to bring the tallow to and continuously keep it in a liquefied state, and even where it has been melted previously to being applied, the moving parts are obliged to accumulate and run constantly under that amount of frictional heat which is necessary to keep the tallow nearest to the parts sufficiently liquefied. This is precisely the case where tallow used to lubricate locomotive cylinders continuously kept at high temperature in the cups, reaches its destination highly heated and minutely divided, in exactly the proper condition for its decomposition under the influence of the steam and pressure. The quantity of accumulated gummy deposits—a combination of stearine with impurities and metallic abraisions, and the result of the destructive action of the acids on the metal—found in cylinders lubricated with tallow, show that tallow even in its purest state, like all lubricants which contain fatty matter equally liable to decomposition, is by no means either an efficient or an economical lubricant. On heavy bearings, on cranks, etc., this same action takes place only in a manner less appreciable for some time, but finally there also the injurious effect becomes noticeable.

What then can we use for efficient and economical lubricating, where a solid lubricant is more conveniently appliable and would be preferable? There are any amount of solid lubricants manufactured and sold under the general name of "grease," but the question arises, which are the best, most efficient and economical?

When we consider, as heretofore mentioned, that tallow is, so to say, the representative of fatty matter in solid form and find even this wanting in the requirements of a good lubricant in grease-form, and take in consideration its market value, we must at a glance perceive that any

solid lubricant in the market which is sold at less than tallow is worth, must be made up with cheaper and inefficient ingredients, and contain real fatty matter, if any, only in a very limited amount and in proportion to the price at which it is sold.

All grease lubricants depend for efficiency on the amount of real fatty matter they contain, and all the combinations of fatty matter with mineral oils and gummy, resinous or waxy substances, with residuum, tar, paraffine, resin, resin-oil and lime-water, or like admixtures partly saponified with alkalies, or still further adulterated with inert matter like mica, asbestos, lead, plumbago, etc., etc., are valuable only in proportion to the amount and quality of real fatty matter they contain. In many such combinations the fatty matter is of so questionable a character that it is necessary to give the grease a deceptive odor to cover the real nature of its composition. Essential oils are costly and the choice for scenting bulky grease very limited. The cheaper oils, such as sassafras-oil, are sometimes used, chiefly, however, nitro-benzole, a product of the action of nitric acid on benzole, commonly known as myrbane-oil, which has a strong bitter-almond odor, and is likewise used for scenting soaps. Aside from imparting its odor to the grease, nitro-benzole is, however, of no benefit to it; on the contrary rather injurious, especially when impure and improperly made.

All fatty matters whether in liquid or in solid form, except the light mineral oils, have a high fire-test; that is they require a very high degree of heat to become vaporized. As vaporization can only be accomplished by heating, accumulation of frictional heat to that degree must take place when metallic surfaces in close contact with each other are in motion, and when to prevent parts from accumulating heat and injuring each other, lubricating with grease is resorted to. Such amount of heat is sufficient to decompose the fatty matter and the bulk of the component part of the grease, unable to vaporize, becomes an encumbrance, the temperature accumulates, the metal expands, and its abrading and dragging on the motion must follow.

Greases made with resin, resin-oil and lime-water, and admixed with inert matter, can relieve friction only partially as the amount of matter possessing lubricating quality is too limited. Grease made from mineral oils alone, even in their heaviest form with the solid or amorphous wax, can only take care of a limited amount of frictional heat. They liquefy freely but cannot keep a hold on the metal unless assisted by admixtures of resinous, gummy or waxy compounds, which likewise abrade the metal and cause drag on the motion when left by the vaporizing portion of the grease.

When we lubricate with fresh suet, the gummy deposits finally left [illegible] vaporization of the oily parts, consist of the charred remains of membraneous tissues which surrounded the globules of fat, and the stearate of the fat in chemical and mechanical combination with abraded metal. With tallow we experience like results, only more prominent, and the accumulations are more bulky. If we lubricate with grease made of mixtures of tallow with addition of resinous, gummy or waxy compounds, we find additional deposits of such admixtures, less the very limited part of their more volatile constituents. If we lubricate with grease compounded with inert matter, we find the cumbersome accumulations still further increased with the exact amount of this inert matter as it is unable to vaporize. Where milk of lime or alkaline-lyes have been used in the manufacture of grease, we find the lime or alkali likewise in the deposits.

It is therefore evident that in all cheap grease lubricants the amount of real fatty matter can only be proportionate to the price and the bulk, and while temporarily serving as a sort of cushion to the real lubricant, becomes finally an encumbrance and a drag on the motion. Lubricating with cheap grease-compounds cannot be efficient and therefore not economical.

We have seen before that lubricating with grease conditions the running of machinery at more elevated temperature on the metal and surrounding atmosphere than when lubricating with oil which is already in a liquid and applicable state, and we should therefore look for the same efficient characteristics in concentrated form in grease-lubricants which we demand in good oil-lubricants. Grease-lubricants of such character, even at the highest prices, will be more economical and efficient than the injudiciously compounded cheap grease-mixtures before mentioned.

The best and most efficient way to lubricate with grease-lubricants is through long slots in the cap of the bearings, which permit the grease to rest direct on the revolving shaft or axle, the slot being provided with covering to prevent dust from settling on the grease. Not every kind of grease can be used in this manner, however, and nearly all, apparently as solid as tallow when put on, soon runs out limpid and powerless, leaving the injurious inert or resinous matter which they contain to clog and injure the bearing; and even suet and tallow, while otherwise efficient will, as mentioned in another place, become decomposed and ere long show their defective character as lubricants.

A grease-lubricant to fulfill all the requirements of efficient lubricating, must possess sufficient compactness for easy application, should melt freely at the slightest rising of frictional heat without running off, and should cling tenaceously to the bearing and be able to vaporize with the frictional heat into space as fast as it is produced by the friction. The grease should contain no fatty matter in a free state which forms fatty acids and becomes rank; no resinous, gummy or gritty matter, and should retain a nearly uniform consistency at different temperatures and not lose its efficiency in warm places. Grease of this character would also work more satisfactory through cups devised and used for applying the numerous kinds of grease, notwithstanding the difficulties attending the lubricating with grease when feeding through limited apertures.

There are lubricating oils which are manufactured in such manner that the fatty acids are properly bound to a basis and incapable of decomposition, forming a perfect neutral oil, free from gum, resin, gelatinous or inert matter of any kind. In their concentrated state they form the most efficient grease-lubricant; equally pure and possessing the same excellent adaptations for lubricating, it melts freely and clings tenaceously to the bearings.

The use of grease on railway car-trucks has long been abandoned for the more unreliable attempts at application of cheap, dirty oils through waste on the capillary principle. Cheap, and therefore poor quality grease, did fail to give satisfaction, but this is no reason why grease, judi-

ciously made, with proper and direct application to the axle, would not be by far the more efficient, reliable and more regularly-working lubricant for truck-axles. There is the factor of saving in motive power, time, wear and care, annoyance and delays, besides ahead of all, safety, on the side of the efficient, moreover more expensive lubricant, against the apparently cheaper ones, the protégé of influence, ignorance and false economy.

THE LOCOMOTIVE OF AMERICAN INVENTORS.

AT an entertainment given in Brooklyn recently by the Kings County Association of Practical Engineers and Machinists, Mr. Angus Sinclair, one of the editors of the *American Machinist*, delivered a lecture on "The Locomotive as Developed by American Inventors." His remarks were, in substance, as follows:

Many people who ought to be better informed believe that the steam-engines that operate our factories, propel our steamboats and pull our railway trains are merely imitations of machines originally imported from Europe, and that all our pioneer mechanics did was to develop the engines and adapt them to American purposes. The facts are very different. If James Watt, the inventor of the condensing engine, and the crowd of Englishmen reputed to be the inventors of the locomotive had never been born, and the work they performed had remained undone, it is doubtful if the mechanical progress of America would have suffered materially. When James Watt in Scotland was struggling to obtain the means of developing the condensing engine, Oliver Evans, a native of Delaware, was engaged working out the invention of the high-pressure engine, where power was obtained direct from the expansive force of steam. Both inventors started from the same point, which was the atmospheric engine of Newcomen. Watt aimed at using steam very little above the pressure of the atmosphere, the vacuum formed in his condenser being the principal source of power. His engine was necessarily a ponderous, slow-moving machine. Evans, by high pressure of steam and high piston speed, aimed to get high power with little weight of engine. Mechanically, Evans was as successful as Watt, but America did not then need the steam-engine badly, for her industries were few and her water-power unparalleled, which accounts for the nation's indifference toward Evans's great invention. Under such discouragement, Evans perfected his engine and established its utility.

Although his work has never received proper recognition from the mechanical world, Evans's engine is the prototype of the high-pressure, high-speed engine that became our national pattern, and of which the locomotive is the most successful example. Readers who receive impressions about the history of inventions from English sources are made to believe that the high-pressure engine was invented by Richard Trevethick. Evans applied for a patent on the high-pressure engine fifteen years before Trevethick began experimenting in that line. The origin of the popular mistake is that English writers on the subject of the steam-engine, while perfectly intimate with the scientific experiments made in Greece and Egypt thousands of years ago, are profoundly ignorant of what is going on in America in their own time. During Evans' time many engineers believed that steam might be successfully applied to land-carriages on common roads, and Evans attempted to apply his engine in this way; but a little experience with the difficulties encountered convinced him that the plan was impracticable. That a steam-engine could run a carriage on common roads under favorable circumstances he proved by making the engine of a steam-scow he made for the city of Philadelphia propel the craft, which was mounted on wheels, through the streets of the city. This was the first case of a carriage being moved by steam on the American continent, and it was done in 1804. Oliver Evans was a prolific inventor and a highly accomplished mechanic. His steam-engine made but little progress into favor during the life of its inventor, but he had perfect faith in its great future. He predicted that his high-pressure engine would be the means of accelerating travel, so that people would leave Washington in the morning, dine in Philadelphia and sup in New York.

The assertion is often made that nothing was done in this country toward building railways till the opening of the Liverpool and Manchester Railway in England proved the success of railway operation to be no longer doubtful. That is not true. There were several short railways in operation in America before the Liverpool and Manchester Railway was opened, and when that well-advertised event took place there were more railways progressing in America than there were in Great Britain. Moreover, an American railroad company was the first in the world to decide that their road should be operated by locomotives. When the directors of the first English railway intended for general traffic were disputing about what power they should use, the majority favoring stationary engines and rope traction, the directors of the Charleston and Hamburg Railroad unanimously decided that they would use locomotives, and gave their manager permission to have the engines built. Which country should first produce a railway that would demonstrate the real value of that system was for a time doubtful. America was poor, but enterprising, and money to build expensive railways was hard to raise. England was rich, but conservative, and the majority of the people were contented with existing institutions and hated change. The friends and advocates of railways in America were not waiting events in Europe to teach them that work was to be done here. The canals that had been constructed at great expense did not prove satisfactory. A few years' experience of them brought many public men to favor railway building. During the decade from 1820 to 1830 this sentiment grew and strengthened rapidly. It produced fruit in the shape of numerous railway enterprises. Individual corporations and legislatures were striving to start the movement, which eventually gave America the finest railway system in the world, and it was only want of available capital that prevented this country from anticipating the railway era by eight or ten years. In 1823 the legislature of Pennsylvania incorporated a company to build a railway from Philadelphia to Columbia, and this became the opening section of the great Pennsylvania Railroad. The Delaware and Hudson Canal Company was also chartered that year, with permission to build a railway as well as a canal. In 1826 a short railway was opened at Quincy, Mass., and during this year the Mohawk and Hudson Railroad Company obtained the right to build

what was destined to be the first railway opened in New York State.

Urging on these railways was the pursuit the progressive men in America were engaged in when George Stephenson was being badgered in the committee rooms of the British house of commons, and popularly regarded as a madman for proposing to move railway trains at a speed of ten miles an hour. The first railway in America that tried operating by locomotives was the Delaware and Hudson Canal, and their first engine, the "Stourbridge Lion," was imported from England. It was a very primitive concern, with a single-flue boiler and upright long-stroke cylinders with the pistons connected by a walking-beam. This locomotive was taken to Honesdale, Pa., and the first trial took place in August, 1829, two months before Stephenson's "Rocket" made her first run in England.

It is often asserted that the designers of locomotives for the pioneer American railways followed British patterns and modified them to suit the condition of their own tracks. This theory does not seem to be supported by facts. The first locomotive built in America for regular railway work was the "Best Friend," which was made at the West Point foundry, New York, for the Charleston and Hamburg Railroad. This engine had an upright boiler and two cylinders set almost horizontally, the piston transmitting the power direct to a cranked driving-shaft. The water-tank and cylinders occupied one end of the carrying frame and the boiler the other. The whole was carried by two pairs of driving wheels coupled by outside connecting-rods. This engine was designed after a model made by the late Peter Cooper, and it had nothing to indicate that the designer had ever seen any of the early English locomotives. In 1830 a small working-model locomotive made by Mathias W. Baldwin attracted much attention, and the maker received an order to build a locomotive for the Philadelphia and Germantown Railroad. The engine was called "Old Ironsides," and in a public trial made a mile in fifty-eight seconds.

Since 1830 the principal improvements effected in locomotives have consisted in working out details, increasing the size of parts, adding conveniences for operating and for promoting economy. In this work of development, the American mechanic has performed an important part. In 1835 the AMERICAN RAILROAD JOURNAL, speaking of railway machinery, says: "There are seven Baldwin engines at work on the Pennsylvania Railroad, on which they have also two English engines from the workshops of the celebrated maker, R. Stephenson. The engineer who has charge of the locomotive department informs me that the power of the American engines is 35 per cent. greater than the English." The first lines of improvement worked on by American locomotive builders were, making the engine adapted to the track, proportioning the working parts so as to obtain security from breakage and durability in service, providing means to keep enginemen protected from the weather, and the restraining of spark-throwing from the wood used as fuel. The adapting of the boiler to use anthracite coal was soon made a success.

Let us review the work done by the American mechanic and inventor toward developing the locomotive. Here is an eight-wheel locomotive, good for mostly any kind of service. The multitubular boiler, so efficient in steam making, is the invention of Nathan Read, an American. It is carried in compact shape by four coupled driving-wheels and a four-wheel truck, a combination patented in 1836 by Henry R. Campbell, of Philadelphia, the truck having been previously invented by John B. Jervis, of Rome, N. Y. The driving-wheels are of cast iron, made hollow, the invention of Thomas Rogers, who was also the first to use weights on the wheels to counterbalance the momentum of the reciprocating parts. Allen paper wheels—a thorough Yankee notion—carry the engine truck, and the tender is carried by cast iron chilled wheels, first invented by Ross Winans. The single-bar frame holding cylinders placed horizontally and bolted together in the center, is a remarkably strong and compact combination, designed by William Mason. The weight of the engine is distributed evenly to the axle boxes by means of equalizing levers invented by Joseph Harrison, of Philadelphia, in 1837. Two fixed eccentrics, invented by James, of New York, give movement to an Allen slide-valve, balanced by a Richardson device. And lastly, the engineer sits in his cab with the full confidence that the whole train is completely under his control through the power furnished by the Westinghouse automatic air-brake, the greatest life-saver of this country.

SOUTHERN RAILWAY LEGISLATION.

THE Southern States have been somewhat behind their more active Western brethren in the formulation and adoption of stringent legislation for the purpose of regulating the railroads. This has been due in part, no doubt, to the natural conservatism of the Southern people and their disposition to let what appeared to be well enough alone; and perhaps the peculiar unprofitableness of nearly all railroad enterprises in that section may have deterred them from restrictive legislation.

It is true railroad commissions have been established in several of these States during the past few years, and two of them with very extended authority; but in the main there has not been any strongly organized general effort in this direction until this Winter.

A railroad commissioner was created in Virginia in 1876, but his duties are simply of an advisory character—the law having been fashioned somewhat after that of the Massachusetts law. The people of Virginia do not seem to have been dissatisfied with this arrangement. The local rates are generally fair and satisfactory, and, so far as railroad development is concerned in that State, Virginia is relatively in advance of any of the Southern States—there being a mile of railway to each 14½ square miles of territory and 588 of population, while the average for the entire South is one mile of road to 30.7 square miles, and to 638 population.

In North Carolina there is no railroad commissioner, but there are general laws against pooling and discrimination in rates, by charging more for a shorter than a longer distance.

In 1883, South Carolina established a board of railroad commissioners, with authority covering the regulation of rates, discrimination, interchange of traffic, and with other very extended powers. Their first move was to make sweeping reductions in the rates for both passengers and

freight, which, with the decreased cotton crop that year, was the cause of much complaint by the railroads. During the fiscal year ending June 30, 1884, about half the railroad mileage in South Carolina failed to earn fixed charges, and only two roads paid any dividends on their stocks, although the bonded indebtedness of the roads in that State is only an average of $16,227 per mile. This law was modified during the session of 1883-84, by rescinding the authority to make rates on freight, but the rates on passengers are still regulated by law. The temper of the people of South Carolina and the press seems still in favor of restrictive legislation.

To Georgia belongs the credit of being the first Southern State to imitate the granger legislation of the West, and in 1881 a board of railroad commissioners was created with almost absolute powers over the railroads in that State. Large reductions were made in the rates on both passengers and freight. The funded debt of the railroads in Georgia is only $12,413 per mile, and the stock $12,574 per mile—a very moderate capitalization; certainly not more than the cost of the roads. Yet out of a total mileage of 2,887 miles, only 1,855 miles pay any dividends on the stock. The result of this legislation in Georgia, seems to have contributed to hinder the flow of outside capital into that State for the purpose of railroad construction, and there are no important railroad enterprises on foot there, either at present or in prospective. In Tennessee the decision of the United States Circuit Court last year, restricting the powers of the railroad commission of the State in their relations with railroads extending out of the State, has secured the roads from an immediate interference. In the remaining Southern States the railroad legislation has been of a comparatively mild character, and they have been left to themselves to develop and reduce their rates by natural competition. During this Winter strong efforts have been made in the legislatures of Florida, Alabama, and Texas, toward the enactment of laws and the establishment of railroad commissions, with powers similar to those existing in Georgia. Our advices from Florida indicate there is an undercurrent of strong feeling against any legislation that will in any way interfere with or hamper the railroad development in Florida, and the various bills introduced are likely to be defeated.

In Alabama the legislation recommended by the board of railroad commissions, which was of an exceedingly rigid character, was very decisively rejected in the House of Delegates. A bill somewhat similar in its terms introduced in the Senate, was so amended as to deprive it practically of all its original restrictive features and then passed, but it will probably be smothered in the House. The general feeling of the people of Alabama as reported, and of the press, seems conservative and opposed to further onerous railroad laws such as those proposed. They are doubtless aware that the railroad mileage of Alabama consists of only one mile of road to each twenty-seven square miles of territory, a great disparity between it and the average of the entire country, which is one mile of road to seven square miles of territory, and there are thousands of square miles of rich mineral and agricultural lands in Alabama undeveloped and comparatively worthless, for want of transportation facilities. The temper of the people of Alabama, as indicated by the press, evidences a desire to invite the investment of outside capital in that State. In this they have displayed a wise and thoughtful course, which is said to have given much assurance to the owners of railroad property there, and confidence in the future prosperity of the State. The wonderful increase in the manufacturing industries of that State during the past few years, which is but a fraction of the possible development of its resources, has drawn the attention of investors to its advantages, and a conservative and protecting course on the part of the lawmakers, will no doubt bring to it a large amount of capital at the first return of confidence.

There have been several bills introduced in the Texas legislature recently looking to the regulation of the railroads, and considerable discussion is going on through the press for and against such legislation, but it is difficult to determine on which side of the question is the weight of popular feeling, and the result can scarcely now be foreshadowed. A bill similar to the Reagan Inter-State bill, modified to fit the State, is attracting some attention, and is probably the most decided legislation proposed. If it is true, as it is claimed, that the rates on cotton from the interior of Texas to Galveston are much higher than to St. Louis, a thousand miles further, then the friends of the modified Reagan bill will have a good argument in its favor; but a law which would remedy this individual difficulty would have to be general in its scope, and while reforming one guilty road, other innocent roads would suffer. There are thirty railroad companies in Texas, aggregating over 6,000 miles, not one of which pays dividends on its stock, and the majority of which scarcely earn their fixed charges. In view of these facts, it would seem that the Texas railroads could not stand much regulation of the Georgia or South Carolina kind. The Southern States have entered upon an era of prosperity which is indeed gratifying to every friend of that section. The railroads have been an important influence in the accomplishment of this result. It is true they have received large benefits from the people, and it is desirable that they should be subjected to such wise laws as will conduce to the efficient fulfillment of their duties as channels of transportation. But the interests of the South cannot be served by laws which seek to deprive investors in railroad property, nor of other property, of a just and reasonable return from their investments, and it is hoped that the Southern States will enact no laws, which, by depriving capital already invested of its rightful remuneration, will intimidate and drive away capital which would otherwise seek investment there.—*Bradstreet's.*

The Advantages of Railway Pools.

CHIEF NIMMO, of the Bureau of Statistics, in a recent report, advanced the following arguments in favor of railway pools:

Pooling organizations appear always to occupy a position of unstable equilibrium. They have the support of a sense of self-interest, and faith in an administrative head, but they lack the third essential element of support, viz., legal recognition. Their instability tends, however, to disarm the suspicion in the public mind that they are essentially combinations inimical to the public interests.

In conclusion, the following general observations may be made in regard to railroad federations and pooling organizations:

1. They have been instrumental in preventing unjust

discriminations through secret rates to favored shippers, and the consequent demoralization of trade.

2. They have prevented many unjust and ruinous discriminations against towns and cities, and against particular States or sections of the country.

3. They have put a stop to violently fluctuating rates.

4. They have had the effect of protecting the weaker lines and of preventing their absorption by the stronger lines, and thus of conserving elements of competition in transportation.

5. By preventing the absorption of the weaker by the stronger lines, they have prevented the threatened danger to the country of its being districted among a few great corporations, by which means the regulating influence of the competition of trade forces would have been eliminated, and transportation would have gotten the mastery of trade.

6. They have tended to prevent those shocks to the financial interests of the country which generally accompany the bankruptcy of great railroad corporations.

7. Since they have been adopted the railroad transportation facilities of the country have been greatly extended. The volume of traffic has also enormously increased, and rates have constantly fallen. These facts seem to prove that railroad federation has not had the effect of obstructing the beneficial operation of the overruling competition of trade forces and of the direct competition between transportation lines. Statistics hereinbefore presented clearly indicate this fact.

8. The most hopeful aspect of federations for the division or pooling of traffic is that thereby the railroads have been brought to a condition in which their accountability to the public interests may be more clearly defined, and in which any departure from undoubted principles of right can be observed and the responsibility therefor located. It is believed to be much easier to regulate great federations of railroads with respect to matters relating to commerce among the States than to regulate a great number of railroads acting independently, for the reason that these federations constitute concrete expressions of relationships and antagonisms both among railroads and among trade centers, and tend to illustrate the relative force of the same.

9. Railroad pools have not proved to be rigid compacts, but they have been constantly subject to change. Occassional and even protected wars of rates render their requirements at times almost entirely inoperative. This must, in the light of public interests, be regarded as a favorable symptom of their practical workings. The conditions surrounding and governing the commercial and transportation interests of the country are constantly subject to change, and it is impracticable that any fixed rules or set of rules should be formulated which in practice would tend to prevent such changes.

It has been suggested that the national government ought to recognize pools and to enforce the observance of their agreements. But their present unfixedness, and the many failures fully to accomplish the results at which they have aimed, seem to render such a step, at this time, premature.

It would be unwise at the present time to assume that no better expedient than pooling can be adopted for the protection of the commercial, industrial, and transportation interests of the country against the destructive and demoralizing results of wars of rates, or to assume that railroad pools as they exist to-day are not susceptible of such improvements as would greatly advance their usefulness.

It has been the object of this brief disssertation upon railroad pooling organizations to describe them historically and in their practical workings rather than to pass judgment upon them. Their relations to the transportation and commercial interests of the country constitute a large and exceedingly important question, and one which might well engage the earnest and careful attention of a national railroad commission.

From America to Russia by Rail.

"THE idea of railroad communication with Alaska will doubtless appear almost preposterous, to many people; but I believe the coming generation will live to ride from Minneapolis to the mouth of the Yukon in a railway coach," said Lieutenant Schwatka, the Alaska traveler and explorer, recently to the reporter of a Western paper. "The Russians are now contemplating the construction of a railroad to the river Amoor, and it is not unlikely that they will continue to the Pacific Ocean to a point opposite Behrings strait. Should this be done the building of a road from some point on the Canadian Pacific, which shall traverse the British possessions and Alaska and connect with the Russian railway will be only a matter of time. The strait at a suitable point of crossing is so narrow that passengers and freight could be easily transported in Summer time from the terminus of one road to that of the other, and in Winter time a regular track could be laid on the solid ice. Just imagine yourself traveling from Chicago to St. Petersburg in a Pullman coach without change of cars. It is a possibility whose realization is more than probable. And I think the project would be a paying one, too. It would not, perhaps, have any serious effect upon ocean traffic, but the route would be largely patronized by European travelers who dread an ocean voyage. There is no reason why a railroad should not be operated successfully in those northern regions, and I do not think there would be any more blockades from snow than in this country. Yet, should this ideal scheme for traveling by rail from one continent to another fail of consummation, we may reasonably expect our railroad to Alaska. The country is able to support as great a population as our average State, and there is no reason why it should not attain the growth of Norway and Sweden. Indeed, it is growing noticeably now, and the immigration in the future will be steady and substantial. The fisheries of Alaska are almost exhaustless. The real fisheries will last forever, the cod-fish will certainly hold out, while the whale and salmon abound in great numbers."

"Are there other resources?"

"Yes; in all probability there exists much mineral wealth. During my trip down the Yukon I found numerous indications of gold, and the river Tanana, at present the largest unexplored stream in the world, gives evidence of the existence of precious mines near its head waters. On Copper river there is known to be much copper, which the Indians have brought to the trading posts in pure sheets. Of course, the mineral interests are all prospec-

tive, but it will not be surprising to see a rush to the country as a result of a discovery of gold in paying quantities. Alaska is still in a very undeveloped condition; it is only last year that a government was given. It is yet crude, though much better than the shotgun rule. It is now possible to take up land under squatters' rights, though the country must first be surveyed before formal grants can be made."

"What is the prospect of the Aleutian Islands?"

"There is a great opportunity for some large monied company to take up these islands and devote them to grazing purposes. The climate is so mild that there will not be any trouble in raising cattle successfully, as grazing is very fair all through the Winter. The islands, I think, will support over 400,000 cattle, enough to supply the whole market of San Francisco and the tributary country."

"Do you ever intend to make another Arctic trip?"

"No; I have had quite enough of that region. I will confine my explorations to Alaska, and am already contemplating another trip this Summer."

Railway Sanitation.

DR. RAUCH, secretary of the Illinois State Board of Health, issues the following circular to the railways of the State:

In connection with the sanitary survey of the State and the house-to-house inspection now being prosecuted under the direction of the State board of health, with reference to the probable advent of Asiatic cholera, your attention is respectfully called to the great good which, at little expense, you may accomplish in two directions—First, in a practical cleaning up and abatement of possible nuisances upon your own premises, and second, in furnishing an object-lesson in sanitary work to the various communities along the line of your road.

The spread of Asiatic cholera is due oftener to the pollution of the water supply than to any other one cause. There is no commoner mode of such pollution than through foul, badly constructed and improperly located privies and water-closets. The disease in this country being always due to importation, and its spread being most commonly by persons traveling from place to place, it follows that railway privies and water-closets are especially exposed to the danger of cholera infection. In view of these facts it is earnestly requested that you cause all such places in conneetion with stations, freight-houses, shops and round-houses to be at once inspected and put in good sanitary condition.

Vaults should be at once emptied—before warm weather makes such work dangerous—and thoroughly disinfected with sulphate of iron (copperas). Where these vaults are within fifty feet of any source of water supply—well, spring, pond, lake or running stream—their further use should be abandoned, and after being emptied they should be disinfected and filled up with dry, clean earth—in itself one of the best disinfectants. The new vault should be not less than fifty feet from the nearest water supply; should be water-tight; ventilated by a four-inch shaft, opening above the roof; the contents should be kept inoffensive by the daily use of dry earth or some other disinfectant; and the building and its surroundings should be kept in the cleanest attainable condition. Where practicable the substitution of the earth-closet system for the subterranean vault-storage is recommended. In either case the frequent removal of the contents, and their safe disposal by use as manure are imperatively sanitary measures.

One of the most important roads in the State has already taken the action above indicated along the entire extent of its line. This board, in its effort toward preventing epidemic disease and consequent interruption and loss of travel and traffic, will be glad to learn of your action in the premises, and to furnish any information or assistance in its power.

Belgian Railway Progress.

A PETITION is about to be addressed to the Belgian Minister of Public Works, praying that orders may be shortly given out for such new rolling-stock and plant as is likely to be required this year upon the Belgian state railways. The price submitted for rails required for local railways in Belgium has been notably reduced after further consideration of the specification. From £5 18*s.* 4*d.* per ton, the price has been brought down to £5 6*s.* per ton. The profile of the rails has been modified so as to admit of their being rolled more easily and readily. Attention is being more directed to the introduction of metallic sleepers upon railways as a means by which Belgian iron masters would be enabled to extricate themselves from some of their present difficulties. A contract has been let for 3,000 axles required for the Upper Italy Railway. The lowest tender was that of the Valère Mobille Company, which offered to supply the axles at £7 15*s.* 6*d.* per ton, delivered free at Genoa; Krupp, of Essen, tendered at £8 14*s.* 9*d.* per ton. The Cockerill, Bochune, Ougrée, &c., companies also tendered. The export of steel rails from Belgium in January amounted to 1,485 tons, as compared with 220 tons in January, 1884; the exports of iron rails were only 56 tons and 95 tons respectively.

Looking After New Cars.

IT it often a matter of pride with car-builders, says the *National Car-Builder*, to have a new car go out on the road and not make its appearance in the shops for eighteen months or two years. We question whether this is good policy. Would it not be much better to have the car come in after six months' service, to have the rods and bolts tightened, cracks in joints stopped, and other precautions taken of a similar kind? When cars are built of timber which has not had a long and thorough seasoning, an overhauling is necessary after a few months on the road. When seasoning-cracks in paint and varnish are closed, the truck taken down, and all looseness due to shrinkage taken out, the car is better fitted to run two years or more without coming into the shop than it was to run a year when first completed. If the history of some of the oldest cars in service could be traced, it would be found that they had been well cared for at first. The life of a car is almost unlimited if the joints can be made weather-tight, the frame kept dry, and the slack of rods, braces and trusses taken up as often as shrinkage

makes it necessary. Cars frequently become rotten at the window-sills and in the posts from weather cracks. These cracks make their appearance in many cars before the varnish needs renewal. Such cracks could be economically stopped without the necessity for re-varnishing. Sometimes the work can be done so quickly that the car will only be detained a few days in the shop. It is very important to have all the iron work of the truck perfectly tight. This prevents the joints from grinding and wearing. While these things are generally understood, they are too frequently neglected, and the result is a great loss to the roads. Cars which should be sound and strong in their frames for twenty years, get out of shape in half that time. The only cause for this is neglect to keep the frame dry and the nuts and trusses tight.

Cost of Operating Early Locomotives.

THE *Engineer* has recently published a good deal of information about early English locomotives, and among other things gives a table of the cost of operating locomotives on the Liverpool and Manchester Railway for the six months ending Dec. 20, 1844. Reduced to cents per mile run this was:

		Cents.
Fuel (coke)		4.04
Oil and tallow		0.44
Waste		0.02
Wages		2.77
Repairs:		
Materials	0.66	
Labor	1.72	
		2.38
General charges, water, cleaning, tender repairs, round-houses, salaries, etc.		3.87
Total		13.52

The coke burned by mile run was 21.5 lbs. The cost of new engines was almost exactly $2,000 each. The weight and load hauled are not given. The statement includes 20 "coaching" engines, 14 "luggage" engines, and 6 "jobbing" engines.

The ratio of labor to material for engine repairs on English railways is now as nearly as may be half of the total instead of nearly 75 per cent., and the total cost a little over 6 cents per train-mile.

Railways of the World.

SOME statistics are brought forward by the Minister of Public Works in Germany, in a report entitled "Archiv fur Eisenbahnen," from which it appears that at the end of 1879 there were in the whole world 350,031 kilometers of railways, which by the end of 1883 had increased to 442,199. Of the 92,168 kilometers constructed in that interval, the United States are responsible for 56,327, while of the more backward railway-making countries 3,727 kilometers were made in Mexico, 2,160 in British North America, 2,050 in Brazil, 2,786 in India, 3,603 in Australia, and 1,166 in Algeria and Tunis. Of the European States, the most active countries in constructing railways during the four years, were France, with 4,500 kilometers, Germany with 2,716, and Austria-Hungary with 2,262; while, on the other hand, the countries with the oldest railway systems and the densest population made comparatively few extension, Great Britain being only at the rate of 1,399 kilometers, Belgium of 257, Holland of 282, and Switzerland of 302. At the close of 1883 the United States was a long way ahead of all other countries in railway mileage, possessing 191,356 kilometers, Germany had 35,800, while France and Great Britain ran a pretty equal race with 27,688 and 29,890 respectively. The smallest railway owner was Greece, which possessed but 22 kilometers, though this proportion is now raised by the opening last year of 100 kilometers between Volo and Larissa.

The Pike's Peak Railway.

THE Pike's Peak Railway, which is expected to be in operation this year, will be the most notable piece of track in the world. It will mount 2,000 feet higher than the Lima and Oroya Railway in Peru. It is now in operation to a point over 12,000 feet above the sea level. The entire thirty miles of its length will be a succession of complicated curves and grades, with no piece of straight track longer than 300 feet. The maximum grade will be 316 feet to the mile, and the average grade 270 feet. The line will abound in curves from 500 to 1,000 feet long, in which the radius changes every chain.

A Valuable Train.

PERHAPS the richest train that has passed over any road in this part of the country was that which went over the Hannibal and St. Joe one day recently. The train was composed of two cars of gold bullion, three cars of silver, eight cars of silk, and four cars of tea. The gold and silver were from Colorado, destined to the Philadelphia Mint. The silk and tea were from California, going to New York.

THE whole exports of iron rails in January from Great Britain were only 1,269 tons, as compared with 832 tons in January, 1884, and 3,245 tons in January, 1883. The whole exports of steel rails sunk to 26,563 tons, as compared with 38,544 tons in January, 1884, and 68,276 tons in January, 1883. The combined exports of iron and steel rails in January were only 27,832 tons, as compared with 39,376 tons in 1884, and 71,521 tons in January, 1883.

THE shunting locomotives in the Prussian service are to be provided with a fire-extinguishing apparatus, by which they can be converted into fire engines at short notice. This arrangement has already been tried in a few cases, and has proven itself of so much service that it is now to be applied universally.

A COMPANY has been formed in Allegheny, Pa., to manufacture iron ties, with a capital of $50,000. They propose to make an angular hollow tie, which will resist concussion as well as wooden ties. Oak timber is disappearing so rapidly that iron ties will soon become an absolute necessity.

IT is claimed by *La Nature* that the highest railway viaduct in the world is that of the Garabit bridge, France. That remarkable structure is 1,800 feet long, and near the middle of the great central arch the distance from the bed of the river to the rail is 413 feet.

IT is computed that there were 52,000 locomotives upon the railways of Europe in 1882. The number of passengers carried during the year was 1,371,000,000, while the aggregate weight of goods carried was 715,000,000 tons.

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THE AMERICAN RAILROAD JOURNAL enters upon its fifty-ninth volume with every indication pointing to a prosperous year. Having definitely adopted as its special field the mission of a railway magazine and review, with which the railway world had not hitherto been furnished despite the numerous publications devoted to its interests, it will continue to be published in its present form, providing a number of interesting contributions each month, together with a careful selection of the most valuable articles appearing in its exchanges, brief notes of interest from a railway, and in fact from a general standpoint, editorials and editorial notes on the railway questions of the day, a live and vigorous department devoted to the growing interests of street-railways, and a department in which the principal new railway and street-railway inventions are described and illustrated. New features will be added as occasions present themselves, and it will be the aim of the publishers to render the JOURNAL a welcome monthly visitor in railway offices, to managers, officials, operatives, and railway men in general. Typographically it ranks among the first, and its present attractive appearance will be maintained.

We again invite and solicit contributions from every source, promising publication in every case where the contribution is of interest and value, and prompt and liberal payment will be made for such contributions. Unfamiliarity with the pen should offer no barrier to the preparation of such contributions, for we are always willing to revise contributions before putting them in type, and the *meat* is what we want—not the dressing. Many old and experienced railway men feel that they could contribute something of value, but are prevented from so doing by their lack of experience in preparing articles for the press. We desire that this shall not stand in their way, for like the ancient sage we believe that a block of marble in the rough is of greater value than a millstone carved into a statue by the hand of a Praxiteles.

It is not to be supposed, however, that contributions form our only desideratum. What we want quite as much are subscribers, and we believe we will get them. Our subscribers have steadily increased since the present style and form of the JOURNAL was adopted in June last, and our new readers are to be found in every branch of railway service, from the shop to the office. The character of the JOURNAL'S contents fits it for general railway reading, and it ministers to one class no more than to another. In the present volume we trust our subscribers will still further increase, and it follows as a natural consequence that the greater the number of readers, the more interesting and valuable can the JOURNAL be made.

Still another branch of the railway interest from which we ask a hearty support—the railway supply men. As an

advertising medium the JOURNAL is unexcelled. Being a magazine and review, containing matter not of mere ephemeral interest, it is carefully preserved, read and referred to a number of times, and generally bound at the close of the year. Thus our advertisers may be certain that their cards will be constantly before the eyes of our readers, and not subjected to a hurried observation before the medium is consigned to the waste-basket. The advertising rates of the JOURNAL are exceptionally low and its advertisements are artistically prepared and advantageously placed. The rates and terms of payment are conspicuously placed upon the first column of its editorial pages, and nothing is hidden from view.

Having bespoken the good-will of the contributing, reading and advertising public of the railway world, the publishers of the AMERICAN RAILROAD JOURNAL start out upon the fifty-ninth volume of the publication with renewed hope for its future. Having been established cotemporary with the introduction of railways in this country it has continued through an unbroken existence of nearly sixty years, and despite its venerable age it will keep alive with the times, and present a faithful reflex of railway progress.

RAILWAY TAXATION IN NEW JERSEY.

OUR sister State, New Jersey, is essentially a railway State. It is the possessor of more miles of railway in proportion to its area than any other State in the Union, and more in fact than any nation or governmental district in the world. The railway legislation which annually crops up at Trenton is therefore not a matter of surprise, and being the proud possessor of this tremendous mileage upon its fertile bosom it is not surprising, either, that New Jersey should endeavor to utilize it, which it has done most successfully; for up to a very recent period the railway taxation assessed by the State sufficed to meet all expenses of government, and it is only in very recent years that the worthy citizens of New Jersey have been brought to contemplate a State tax upon individuals and upon individual property as a possibility of the near future.

Necessarily, the appraisement and taxation of the railway interests of New Jersey gradually became a task of no small proportions, and last year an act was passed by the legislature, entitled "An act for the taxation of railroad and canal property," by which the labors of assessment and taxation were to be performed systematically; and the first annual report of the State Board of Assessors, appointed by the Governor under the provisions of this act, is before us. The report is an admirable one, and affords an interesting study of railway progress in New Jersey. When it is remembered that under the provisions of the act the Board of Assessors have also to determine the taxation of all insurance companies doing business in the State, as well as of all gas, electric light, telegraph, telephone and cable companies, pipe-line oil companies, and a host of miscellaneous corporate bodies, their industry and indefatigable attention to the work in hand are deserving of the greatest praise.

It is shown by this report and verified by experts, that, in the State of New Jersey there are in main line of railway, 1,871.237 miles; of double track, 473.402 miles; of sidings, 979.645 miles, making the total railway mileage of the State, 3,324.284 miles. Of this total there are 1,741.337 miles of steel rail, and 1,582.947 miles of iron rail. Doubtless each succeeding report will show an increase in the former and a decrease in the latter. The area of New Jersey being 7,815 square miles, there is one mile of railway to every 4.17 square miles of territory, and the nearest approach made to this railway mileage is in Massachusetts where there is one mile of railway to every 4.25 miles of territory.

The Assessors have determined the value of railway and canal property in the State, including franchise, as $195,525,963.87, being an average of $104,490 per mile, and upon this valuation a State tax of one-half of one per cent. is assessed, in addition to local taxes. The State nets from this tax the generous sum of $977,628.76 for its expenses of government, and thus the labors of the Board of Assessors are productive of good results.

The exhaustive manner in which the railway property of the State has been examined, subjected to careful appraisement and assessment, speaks well for the Board, and it is worthy of mention that every mile of railway in the State has been examined by careful surveys. That there are complaints on the ground of unjust taxation is not to be wondered at, when the magnitude of labor necessary to compile the report is considered, nor is it impossible that some portion of this complaint is well-founded, but the work of the Assessors has been intelligently and honestly performed, and the system of taxation now in vogue in New Jersey we should think would meet with general favor at the hands of its citizens, even if the railways are not entirely pleased.

RAILWAY INVENTIONS.

A CORRESPONDENT, who is also the inventor of a new railway appliance, writes us to inquire why it is that railway officials take so little interest in the examination of new inventions designed for railway use. We are not disposed to believe that railway officials are indifferent in the matter of examining new appliances, and we believe that true merit in railway inventions will sooner or later meet with recognition; but the fact is indisputably true that a large percentage of so-called railway patents are

not inventions in the truest sense. An invention is either the result of inspiration or of hard study to overcome certain obstacles, whereas many of the railway patents are hastily conceived appliances, whose sole *raison d'etre* is the fact that the patentee acquires proprietary rights of more or less value, principally less. Every month sees nearly two hundred patents taken out upon railway appliances, and out of these two hundred few of the devices patented are without serious drawbacks. Had the patentees taken a little more time to perfect their inventions, the percentage of valuable patented railway appliances would be greater; but the temptation is strong to apply for a patent as soon as the device is conceived, even in its most primitive form, and as a result railway officials are overrun with a vast amount of correspondence relative to "improvements" that are practically worthless; therefore, they cannot be blamed if they refuse inventors opportunities to test their patents, when a single glance of an experienced eye will demonstrate their worthlessness. Another point to be considered is the fact that patented devices are like babies—dearer to the authors of their being than to others, and attractions are visible to the inventor when contemplating his device that do not appear to the unprejudiced eye. Every month the JOURNAL publishes descriptions of a number of the most valuable railway inventions, and a still greater number are refused description through the poverty of the device itself. Yet the patentees of the latter class are by far the most importunate, and letters are constantly received offering us a small interest in the sale of certain appliances if we will publish the descriptions thereof. Doubtless the patentee marvels at our fatuity when we decline his princely offer, and thus refuse a fortune, but then he is a fond parent and his offspring is a thing of beauty in his eyes. Herein lies much of the difficulty, and it is not to be wondered at that railway officials decline to be bored by the inspection of host of inventions that by no possibility could ever prove themselves of practical utility.

EDITORIAL NOTES.

THE famous Arctic explorer, Lieut. SCHWATKA, indulges in the hope that America may yet have a direct railway communication with Asia, *via* Alaska, Behrings Strait and Kamtchatka. It is his idea that a steam-ferry could connect Alaska with Kamtchatka during the Summer months, while in Winter, tracks could be laid upon the ice and an "all-rail route" constructed. While he was about it he should have bridged the strait, a large draw being provided for the passage of icebergs. Fish-horns should also be furnished to icebergs, upon application and presentation of testimonials of good moral character, by which the bridge-tender could be apprised of their approach. Doubtless these, as well as other minor improvements, will be suggested to the Lieutenant's mind in good season.

* * *

THE reorganization scheme submitted by the West Shore Committee has not met with universal satisfaction, but it is doubtful if a better one could have been devised. When the affairs of a road become so tangled as are those of the West Shore, it is much easier to criticize than to suggest, and if the unfortunate ones who have already invested their money in the road do not think the outside public will come to the front and purchase the new bonds, they had better make up their minds to purchase them on their own account and protect themselves. Grumbling won't mend matters.

* * *

CHINA is making rapid progress with her railways, and a recent non-progressive Mongolian who memorialized against the introduction of railways has been sat upon with small mercy and handed over to the Board of Punishment. This Board strikes us as an excellent thing, and we would like to see it introduced on this side of the Pacific. There are a number of assinine memorialists in this country who could be brought under its jurisdiction with beneficial effect.

MR. WILLIAM O. STODDARD has recently given to the public an interesting biography under the title of "Abraham Lincoln: The True Story of a Great Life." The career of the great American is traced from boyhood to his fall by the hand of an assassin, and as Mr. Stoddard was one of Mr. Lincoln's secretaries during the rebellion, the work bears with it an intimate personality not often found in the biographies of great men. Its illustrations are few, and not quite up to the standard of the work itself, but the book is one destined, we think, to meet with a large sale. It is published by Fords, Howard & Hulbert of this city. In form it is an octavo of 508 pages, and is sold at $2.75 cloth, and $3.50 half roan.

AN interesting budget of publications has been received from Cassell & Co., of this city, including their *Family Magazine*, *The Quiver*, and the *Magazine of Art*. These are always welcome visitors, and like old wine, improve with time. The *Magazine of Art* for May is a beautiful number, and contains some exquisite engravings, with accompanying letter-press. The *Family Magazine* and *The Quiver*, are, as usual, handsomely illustrated and offer most attractive reading.

"WATCH AND CLOCK MAKING," by David Glasgow, is the title of an interesting little volume published by Cassell & Co., in which the horological art is treated at length and illustrated by a number of diagrams. The author is the Vice-President of the British Horological Institute.

THE *Chicago Popular Monthly* continues to cater to the public as a cheap and interesting magazine for general reading, while the character of its contents is not lowered on account of its popularity.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.
First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.
Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.
Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.
Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.
The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

THE PROBLEM OF CABLE TRACTION.

HAS there been too great precipitation in the matter of constructing cable roads, and is the cable road after all the successful solution of the traction problem? We ask this question in all earnestness, and while having devoted considerable space to the subject of cable traction, are as yet by no means sure that the cable road of to-day is the best form of street-railway that can be devised. That in many respects it possesses conspicuous advantages over roads employing horses as a motive power cannot be denied, but the construction of cable roads has been so rapidly entered into that it is only reasonable to suppose that many of their serious drawbacks have been overlooked and still remain to confront both the public and the builder. But a few months ago the construction of the cable road of the Philadelphia Cable Traction Company was begun, and now the following intelligence has been received from that city:

"The cable road of the Philadelphia Traction Company, constructed through twelve miles of the principal streets of the city, has been found to be radically defective, after a cost of $600,000 to the projectors, and one of the engineers engaged upon the system expressed the opinion that $250,000 would be required to correct mistakes and make the road practicable for traffic in cold weather. When the iron conduits through which the cable passes, were laid, iron rods were run through the stringers and bolted to the top of the conduits just below the slot where the grip passes down to the cable under the street. Every change of temperature has been found to affect the width of the slot and hinder the passage of the grip. Work has been begun to remedy this error; the ground must be torn up over the entire twelve miles of track laid, and substantial new ties and iron braces are to be inserted in place of the defective ones. The projectors of the road visited Chicago to examine the system in that city two years ago, but attempted improvements in this city which will now cost a quarter of a million to undo."

Probably the defects thus enumerated will be overcome, and the road put in perfect working order, but the outlay will be large and to a great extent unnecessary; for had sufficient thought and experiment been devoted to the consideration of the possible defects of the system beforehand, it is highly probably that a different system would have been adopted.

Still again the *Evening Post* of this city discourses at length upon the serious drawbacks of the cable system in Chicago, prompted to this course by the possible contingency of the construction of a cable road in this city, and especially upon Broadway. The *Post* has been the uncompromising opponent of the contemplated Broadway cable road, and speaks as follows of the disadvantages of cable roads:

"In the matter of the petition of the Cable Railway Company for permission to exploit the streets of New York, some interesting affidavits have been filed showing the objections to that system of street travel as developed by experience in Chicago. Before mentioning them in detail a few words upon the differences of conditions in the two cities will not be out of place. The city of Chicago when it adopted cable railways for a portion of its street travel was practically inhibited from adopting the elevated system by a provision in the State Constitution which declares that private property shall not be taken or *damaged* for public use without due compensation. This provision was believed to interpose an insuperable obstacle to elevated railways, since the compensation to be awarded by juries to property-owners along the lines might swell the cost to an amount far exceeding the cost of the structures themselves, and make the enterprises unremunerative from the start. Underground railways were likewise objectionable for the reason that the road-bed would be in all cases below the level of the lake, and would require constant pumping to keep them free from water. The city required, nevertheless, enlarged facilities for street transit, and only adopted the cable system as the only means for securing at once greater speed and additional accommodation. Neither of the difficulties which interposed themselves in the way of overhead and underground travel there, existed, or were supposed to exist, in New York when the elevated system was proposed here. Moreover, the streets assigned to the cable roads in Chicago were considerably wider than the ordinary streets of New York, affording more room for traffic on either side of the railway tracks. The streets of Chicago were also everywhere level and for long distances absolutely straight, in the crowded as well as the more open sections of the city.

"The first and most serious objection to cable railways is that the motive power is unintelligent, and therefore disregardful of obstructions in its course. Any disarrangement of the machinery which prevents immediate stoppage is liable to lead to a collision, or cause the loss of human life. Horses will stop or turn aside instinctively to avoid collision, but a cable-moved car stops for nothing except in obedience to the brake, which may be out of order or may not be applied with sufficient force or sufficient celerity by the driver. A horse will not run over a man voluntarily. A cable car will run over any number of persons or things with the uncontrollable impetuosity of steam. The momentum of the cable cars, as operated in Chicago, is about four times greater than that of any ordinary street car, the cable trains consisting usually of three passenger-cars and a "grip-car" which also carries passengers. The weight of this propelling force is sufficient to knock into fragments the most heavily loaded truck that can be moved by horse power. Casualities of this sort were frequent and the loss of life alarmingly great in Chicago when the cable cars were first put in operation in Chicago, but experience has taught both drivers and pedestrians to give the "grip-cars" a wide berth. In other words, the usefulness of the streets for ordinary travel has been seriously impaired by the introduction of these machines. Speed, in the less frequented portions of the city, has been obtained, but at the expense of room and security for ordinary traffic.

"Another difficulty of cable locomotion is that the breaking or derangement of a cable dislocates the whole system. Since such accidents are liable to happen at any time, horses must be kept in readiness at convenient stations. The economy of the cable system is greatly lessened by this requirement, and it is open to grave doubt whether there remains any route in New York upon which it could be applied with advantage in the mere matter of dollars and cents. In the lower parts of New York the curves in the streets are so frequent and abrupt that the cable system could not be worked even with the speed of ordinary horse-cars, and it is

here only that trains of cars could be filled. It may be said, indeed, that for New York at the present time the cable system is as far behind the age as the street-car and the omnibus were ten years ago. When we take another step in the way of rapid transit, let it be an improvement upon existing facilities, and not a doubtful experiment or a new obstruction to present means of travel."

We do not wish to place ourselves as opposed to cable roads, for such in fact is far from our true position. We have steadily maintained that the advantages of such roads, properly constructed, were great, and have published a series of articles on "Cable Road Construction" by the leading cable engineer of the country; but we certainly do discountenance the general "hurrah" with which the cable system is being pushed, and urge that a little more attention be devoted to overcoming obstacles of construction *before* instead of *after* the rails are laid. It appears to be a settled principle with cable road engineers, that every cable road must have some new feature, and generally must be constructed entirely on a new model. Well-known and successful methods of constructing cable roads have been put aside and every new road built is claimed to possess superior advantages over those previously constructed. It has been the aim of the builders to furnish a road, not so much with reference to its quality as to its novelty, and here would seem to be one trouble. If the builders would stick to what has been found good, and not build on the experimental fashion, the lapse of time would show the ways for overcoming difficulties at present existing; but so long as each builder constructs a different kind of road, so long will the obstacles increase instead of diminishing.

Furthermore, because a cable road meets with favor in San Francisco, for instance, and is in successful operation in that city, it does not necessarily follow that such a road would be suitable for Broadway in New York, or for similar thoroughfares in our leading cities. Location has much to do with the success of cable roads, and this perhaps is but one of a dozen questions to be considered before the construction of a cable road is entered upon. Cable traction is yet in its infancy, whereas it has been treated as a full-grown and developed system, and therefore to the question we propound, an affirmative answer may be given with considerable truth.

At the present writing there are an ample number of cable roads in this country on which experiments may be made with a view to overcoming such drawbacks as may from time to time present themselves, and there is no earthly benefit to be derived from constructing more cable roads on new and "improved" principles, unless these principles have lost a little of their "newness" in the way of previous experiment. An unmerited prejudice against cable roads may readily be awakened by a series of failures, and the growth of cable traction more injured than fostered by undue haste in the construction of new roads on new principles.

THE QUESTION OF RAILS.

BY AUGUSTINE W. WRIGHT.

[Written for the AMERICAN RAILROAD JOURNAL.]

I WAS much interested in the article on "Center-Bearing *versus* Side-Bearing Rails," from the able pen of Mr. A. J. Moxham in the February JOURNAL. Six or seven years past when laying a piece of track, I thought, "Now, if I retain the outside of my stringers in place, the track will be secure. The flange on the car-wheels prevents its becoming narrow-gage, and every vehicle that turns out of the tram tends to widen the gage; there is nothing in this city tending to narrow the gage." I therefore securely spiked cast iron angle-irons to the outside of the stringers, two on each cross-tie, and spiked the inside lower edge of the stringer to the cross-tie with six-inch cut spikes. This, I assumed, with paving in the horse paths, would hold the track to gage. Much to my surprise within three or four months I found the track wide-gage. Upon taking up some pavement, I found the stringer had turned on the top of the cast iron knee. The bottom had crowded in an inch or more. It is needless to say that ever since that date I have used four cast angle-irons upon each cross-tie, two small ones inside and two higher ones outside of the stringers. A heavily loaded street-car is, in Chicago, the greatest weight upon our tracks. At times it equals three tons upon each car-wheel. With our side-bearing rail, this pressure all comes outside of the center of the stringer and tends to tip it over. Then consider the effect of a heavily loaded four-horse truck in turning out of our track. The head of rail being one inch above the tram on which the wagon travels, the horses acting with a leverage equal to the distance of the end of the tongue from the forward axle, exert a force against the rails which must either spread them or lift the wagon and load above the head.

The extent to which heavy traffic seeks street-railway tracks is not generally appreciated. A paper I wrote some years since, "The Best Pavement for Horse-Railroads," contained the following: "On April 14th, 1881, I stationed a man with pencil and paper on North Clark street, between Elm and Division, for ten hours, from 7 A. M. until 12 noon, and from 1 P. M. until 6 P. M., with directions to carefully count every vehicle that passed, and note those whose wheels traveled upon the rails, those that used the sixteen feet of pavement maintained by the railroad company without being on the rails, and those that traveled outside of the sixteen feet. He reported 2,052 vehicles upon the rails (including 642 cars), 61 vehicles upon the sixteen feet aforementioned but not on the rails, and 53 vehicles outside the sixteen feet. In other words, that portion of the street maintained by the railroad company was used forty times, where the balance of the street was used once! The street, was then paved with pine blocks from curb to curb. You will remember that this is at a point distant a mile and a half from the Court House, where the travel is relatively less. April 28th, the same man was stationed on Lincoln avenue near Webster, from 7 A. M. until 12 noon. He reported 367 vehicles as passing on the rails (including 185 cars,) 66 on the sixteen feet maintained by the railroad com-

pany, and 62 outside. The horse paths were paved with cobble-stone and the balance of the street with new cedar block pavement. From 1 P. M. until 6 P. M., the same day, he counted in front of Lincoln Park, where the horse paths were paved with cobble-stone—the street, exclusive of sixteen feet, consisted of soil in fine order after a shower of rain—788 vehicles using the rails (including 320 cars), 85 on the sixteen feet but not on the rails, and 97 outside. The sixteen feet was here used nine times to one outside."

Considered from different points of view, the question will be differently answered. So far as company horse-power is concerned, it must be admitted that the center-bearing rail is the one most free from dirt, and therefore requiring the least tractive force. Considered from a track standpoint, it is undoubtedly the best. If the head is not high, the vehicles do not exert the same force to spread the track in turning out. Mr. Moxham speaks of reversing the side-bearing rail, and thus having the tram come on the outside, then all the tendency would be to narrow the gage, and this would not interfere with the cars unless it became too narrow to carry the wheels. This construction was advocated in 1859, but so far as I know, never put in practice. When, however, this question is considered from a pavement point of view, the side-bearing rail is the best, unless the center-bearing is made with trams equally as wide. The steel or iron rail affords the cheapest possible wearing surface for the traffic that does seek the street-car track, and if the wheel does not travel on the rail, causes rapid wear and depreciation of the pavements. Everything taken into consideration, I believe that every street-railway company would buy the center-bearing rail, if permitted so to do by the various municipal authorities. I can add nothing more to the valuable and interesting article of friend Moxham.

THE LIABILITY OF STREET-RAILWAY COMPANIES FOR NEGLIGENCE.

BY O. S. BRUMBACK.

[A Paper read before the Convention of the Ohio State Tramway Association.]

THE liability of street-railroad companies for negligence, is an important question to all who invest in this species of property. From the very nature of their duties and property, street-railroad companies are peculiarly liable to answer in the courts. Traversing crowded thoroughfares, where people of all ages and conditions congregate and transact their daily affairs; expected to make fast time along avenues crowded with vehicles, and blocked with the commerce of a metropolis; with a thoughtless class of men (as a rule) for their servants; with limited facilities for guarding against prospective damages, and no means of taking precautions against the indiscretion of the old and the innocence of the young; and last, but by no means least, with the popular prejudice, both of courts and juries, against railroad corporations—the lot of a street-railroad company in court is "not a happy one." Liability of a railroad company for negligence is a broad theme, and widens into such a variety of cases—justice to the subject could only be done in a treatise of large dimensions. I can only hope, in the short time allotted me, to give a general idea—a bird's eye view, as it were—of the law of negligence in Ohio, and particularly as applied to street-railroads.

Negligence has been tersely and aptly defined in an English case as "the absence of care according to the circumstances,"[1] and more clearly in another case as "the omission to do something which a reasonable man, guided by those considerations which ordinarily regulate the conduct of human affairs, would do, or the doing something which a prudent and reasonable man would not do."[2] And in a case in the United States Supreme Court, Justice Field said: "It (negligence) must be determined in all cases by reference to the situation or knowledge of the parties, and all the attendant circumstances. What would be extreme care under one condition of knowledge and one state of circumstances, would be gross negligence with different knowledge or changed circumstances."[3]

We thus see the question of negligence is largely a relative one, to be determined by the facts in the case. It is the province of the jury to find from the testimony what was the knowledge of the parties and the attendant circumstances, and the court will instruct the jury as to the effects of these facts in making out a case of negligence. Where there is no controversy as to the facts, of course there is no need of a jury, and the case is one of law for the court alone to decide whether the said facts make out a case of negligence.[4]

Having thus determined what negligence is and who determines it, we will pass to the question of liability for negligence, or what constitutes a case of negligence for which recovery may be had.

There is a well-known principle of the old English law engrafted upon our American jurisprudence of *respondeat superior*, which is to say, an employer holds out his agents as competent and fit to be trusted, and is liable for their acts within the scope of their employment.[5] This principle, when applied to negligence, gives us the general American doctrine, that a party guilty of negligence, or his employer, must answer in damages to the party injured, provided the injured party is not in fault in failing to exercise care himself.[6]

When a party contributes to his injury by failing to exercise ordinary care under the circumstances, the law justly concludes he is to blame himself, and will not permit him to recover for his own wrong; for certainly it would be hard to separate the wrong of the one from the wrong of the other.[7] This provision of the law is the chief bulwark of a railroad company in a battle in court. If the company can show the plaintiff was guilty of negligence himself, contributing toward causing his injury, it will have a complete defense. There is a limitation to this rule, however; in a case where the "negligence of the defendant is malicious, or so wanton and gross as to be evidence of voluntary and willful injury on his part, and the fault of the injured party is merely the want of ordinary care, it does not fall within the general rule—the faults not being of the same nature."[8] In a large proportion of damage cases there will be found contributory negligence, and it should be the first duty of the managers of a railroad company, in case of an accident, to immediately investigate if there are not witnesses who will testify to guilty negligence on the part of the party injured. But what constitutes guilty negligence? What care is necessary to avoid being negligent? The degree

of care necessary to be exercised, is an important feature in the eye of the law, and as before stated, depends upon the surrounding circumstances. It varies greatly, but we may say it must in all cases be at least *reasonable* or *ordinary* care. In others it must be more than ordinary—it must be *great care*, and in still others it must be *excessive*—the greatest care that can be exercised, if liability would be avoided. For convenience in considering these degrees of care that must be exercised, we will consider:

1. Liability of street-railways to the public for want of care; and

2. Liability of street-railways to their employés for want of care.

(*To be continued.*)

1. 5 Hurl. and N. 678.
2. 11 Exch. 784.
3. 15 Wall. 524.
4. 28 Ohio St. 340.
5. Ohio St. 207; 28 Id. 28.
6. 25 Ohio St. 88.
7. 2 C. S. C. R. 268.
8. 22 Ohio St. 20.

An Elevated Cable Road in Brooklyn.

AN important grant has recently been made by the Brooklyn Board of Aldermen, by which the Brooklyn & Long Island Cable Railway Company is awarded a franchise to construct an elevated cable railway from the bridge and from South Ferry to East New York. The main line will be in Atlantic avenue, and the bridge branch in Boerum place and Adams street. The companies interested in the organization (the Long Island and the Atlantic Avenue roads) are to unite with the city in seeking such legislative action as will remove steam from the surface of Atlantic avenue, as far east as Brooklyn avenue, except for freight-cars, and for these only from midnight to 4 A. M., after the elevated structure is built. The cable company is to construct the elevated road to Flatbush avenue within eighteen months, and to Brooklyn avenue within three years, under penalty of forfeiting to the city 7½ per cent. of the gross receipts of the part of the road in operation, a bond of $500,000 being given.

An Electric Railway in Baltimore.

THE Baltimore and Hampden Railroad, which is to be a suburban branch of the Union Passenger Railway of Baltimore, is in process of construction and is almost completed. The road starts from Huntington avenue and Oak street, Baltimore county, and passes through the villages of Mt. Vernon, Hampden and Woodberry. It is the intention of the company to use electricity as a motive power, modeled on the system in use on one of the long piers at Coney Island. A motor, independent of the cars, is being made to try the experiment, and if it is successful it is likely that the future motors will be part of the cars. The length of the new road is 2¼ miles and it is expected to be soon ready for use.

Coal Consumption by the Brooklyn Bridge Railway.

FROM a recently prepared statement it appears that the average coal consumption per day, for car service on the Brooklyn Bridge is six tons, which does the moving of the 1½ in. cable, 11,450 feet long and weighing 40,075 lbs., at a speed of ten miles per hour for 20 hours per day, and keeps from 10 to 20 cars, weighing 10 tons each, constantly moving, the total number of car round-trips per day being 1,200. The power required to move the cable and machinery alone, without cars, is 35 horse-power, which corresponds to a tensile strain of 1,312 lbs., or about 66 lbs. per ton weight of cable. Allowing the rolling friction of the cars to be 6 lbs. per ton, and nothing to be lost by grade resistance (since the cars remain attached to the cable in descending and give up the power lost in ascending) the average power required to keep the cars in motion is 14.52 h. p. additional, or a total of 49.52 h. p., from which it results that the coal consumption per horse power per hour is only 1.36 lbs., which is certainly very low, calculated to raise a suspicion that the rolling friction of the cars is not quite so high as assumed, especially as no allowance has been made for the heavy average load of passengers.

The Louisville City Railway Company.

THE stockholders of the Louisville City Railway Company held their annual meeting on the 12th inst., and elected as directors Maj. Alex. H. Davis, St. John Boyle, E. C. Bohne, H. B. Hanson, Theodore Harris, Alex. P. Humphrey, and H. H. Littell. The directors organized and elected Maj. Alex. H. Davis, president; St. John Boyle, vice president; R. A. Watts, secretary and treasurer; H. H. Littell, superintendent. A dividend of three per cent. from the earnings of the past six months, payable April 1, was declared.

An Oil-Burning Street-Car Motor.

A MOTOR to burn earth oil is being constructed by Messrs. Merryweather, of London, England, for the Rangoon Steam Tramways. Previous experiments in this direction having proved satisfactory, a large saving in the cost of fuel is anticipated.

STREET-RAILWAY NOTES.

THE American Electric Railway Co. has filed certificates of incorporation in New York, with Cyrus W. Field and others as corporators. The company is organized to build, own, sell or let locomotive engines to be operated by electricity, and also cars and other railway machinery.

THE Brooklyn (N. Y.) courts have decided that the "bobtail" cars of that city must be provided with conductors, in accordance with an ordinance to that effect passed by the common council.

A NEW cable road is to be constructed in Cincinnati, three miles in length, extending from the city to Walnut hills, up a heavy grade. The road is expected to be opened for traffic by July 1st.

THE Montgomery (Ala.) Street-Car Co., having organized and bought material, will proceed with the construction of their road.

THE description of a new cable grip is published in the department of New Inventions of this issue of the JOURNAL.

New Inventions.

Colby's Sleeping-Car.

JAMES F. COLBY, of Buffalo, N. Y., is the inventor of a sleeping-car which is herewith illustrated and described. It is the object of the inventor, first, to provide such an arrangement of seats in a railway-car that they may be made of sufficient length to enable passengers to lie down at full length on them; second, to provide such an arrangement of transverse seats in a railway-car that one set will occupy one side of one-half of the car, and the other set will occupy the opposite side of the other half of the car, thus effecting an equal distribution of the weight; third, to provide, in addition to the transverse seats in the car, seats running in a longitudinal direction, which are also of sufficient length to enable a passenger to lie down at full length, and arranged relatively in the same manner as the transverse seats; and, fourth, to provide a support for the seat, a portion of which will also serve the purpose of a head-rest.

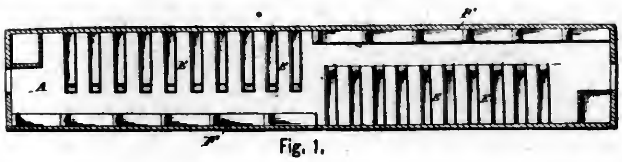


Fig. 1.

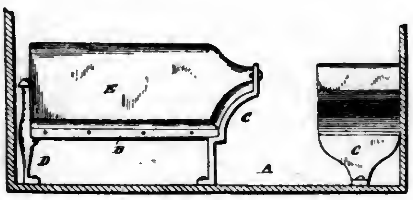


Fig. 2.

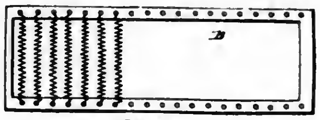


Fig. 3.

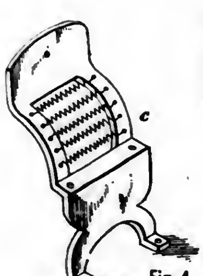


Fig. 4.

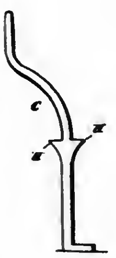


Fig. 5.

COLBY'S SLEEPING-CAR.

In the accompanying cuts, Fig. 1 represents a plan view of the flooring of a railway-car, showing the improved manner of arranging the seats; Fig. 2 a cross-sectional view of a portion of the car, showing one of the transverse seats in front elevation and one of the longitudinal seats in end elevation; Fig. 3 a plan view of the seat-frame with the upholstering removed; Fig. 4 a detail perspective view of the support and head-rest, and Fig. 5 a modified form of the head-rest.

A is a car-flooring, which may be of the ordinary or any approved construction, on which is mounted two sets of transverse seats and two sets of longitudinal seats. The former of these seats are placed so that one set will occupy one side of one-half of the car, and the other set will occupy the opposite side of the other half of the car. The object of this arrangement is to afford room for seats of such length as to enable persons to lie down upon them at full length, and also to effect an equal division of the weight on either side of the car. The longitudinal sets of seats are arranged relatively with the other in the same manner as the transverse seats are relatively arranged. The several seats of each set in the longitudinal series are contiguous one to the other. The transverse seats are constructed of a frame B, of metal or of wood, and provided with a series of apertures. Secured to these apertures are a series of transverse curled or spiral wire springs, which collectively form a support for a mattress or cushion.

C refers to the end pieces of the respective seats, the same being preferably constructed of cast-iron. The lower portions of these pieces constitute the supporting-legs for one end of the seats, and the upper portions constitute head-rests. The portions forming head-rests are curved upwardly, so as to bring them in a plane above the seat proper, as indicated, so as to form a convenient and comfortable support for the head, and to lengthen practically the seats by reason of their overhang. They are provided with a series of apertures, to which are connected the springs, as above described in reference to the frame proper of the seats. This piece C, is further provided, at the upper end of the part which constitutes the supporting-legs, with an offset adapted to receive and sustain the adjacent end of the frame B. The opposite end of this frame is supported by a leg D, the upper portion of which terminates in an arm of any approved configuration. These seats are provided with the usual backs E, the arms by which they are pivotally connected with the seat being in this instance attached to a convenient part of the head-rest and to the seat-arm. If desired the transverse seats could be placed back to back, thus forming compartments, which by means of curtains could be shut off from the rest of the car.

F refers to the longitudinal seats, the frames of which are constructed in the manner above described. The head-rests are also constructed in the same manner, save that in this instance they are provided with lugs H, instead of with the offset, whereby the supports for the frames are provided.

As represented in Figs. 1 and 5, it will be observed that the head-rest of each horizontal seat overhangs the foot end of the next succeeding seat, thereby economizing in space and utilizing all the available room in a car.

The lower portions of the pieces which constitute the head-rest also form, as above described, supporting-legs for the longitudinal seats. These legs may be of any desired configuration, so as to be secured to the flooring or to the sides of the car, as represented in Fig. 2. The cushions, which are fitted upon the seats, are supported by the springs secured to the frame of the seat and to the head-rest, and are of such configuration as to cover it evenly and smoothly.

From the above arrangement it will be seen that the seats can not only be made sufficiently long to accommodate persons in a recumbent position, with their weight equally distributed over the car, but at the same time ample room remains for a proper passage-way or aisle.

Phelps' Induction Telegraph System.

Lucius J. Phelps, of New York City, is the inventor of a system of telegraphic communication to and from moving trains, that is already in practical operation upon one road, and seems destined to be generally employed. The inventor, who is a well-known electrician, has ingeniously made practical use of a feature of electrical communication that has hitherto been regarded as a serious drawback, illustrating the adage that "out of evil cometh good." It has long been known that if two wires are extended parallel, near to but not in actual contact with each other, and a current of electricity be sent through one of the wires, a momentary current will be excited in the other wire, flowing in an opposite direction to that in the first. This peculiar phenomenon has been particularly noticed in telephone wires, and much confusion has resulted from the intermingling of currents from wire to wire. Much time and ingenuity have been expended by inventive electricians to overcome this feature of electrical communication, known as *induction*, but Mr. Phelps is apparently the first to perceive in it a positive utility.

With the knowledge of this phenomenon Mr. Phelps has devised a telegraphic system, properly called the *induction system*, by which telegraphic messages may be sent and received to and from railway trains moving at any speed. The accompanying cuts illustrate the construction and operation of the system.

Fig. 1 represents a smoking-car of the usual construction, with the device attached; Fig. 2 the electrical apparatus stationed in one corner of the baggage-compartment of the car, and Fig. 3 a section of the track with the secondary wire encased in a wooden trough or tubing.

Under the car A, runs a section of gas-pipe BB, supported by rods and extending the distance between the forward and rear trucks. This pipe lies parallel to the track and at a distance of about seven inches from it. Through this pipe extends a continuous wire, which passing up into the car, makes ninety convolutions, and is connected to the telegraphic apparatus C, shown in Fig. 2. A continuous wire of 1½ miles is thus furnished, or nearly ¾ of a mile of wire directly under the car. Between the rails DD, D'D', is laid a wooden trough or tubing EE, extending the whole length of the track, or for so long a distance as the system is desired to operate. Through this trough or tubing, runs a wire F. connected with telegraphic apparatus at any number of stations along the line. In brief, the system is now in condition for practical operation, the various modifications and devices for overcoming obstacles being of secondary importance, though they will be described later. The operation of the induction system is as follows:

It being desired to send a telegraphic dispatch from the train, the operator transmits it through the wire running through the tube BB, under the car. By the principle of electrical induction a current is excited in the wire F, running through the wooden trough EE, between the rails, and the message is duplicated upon this wire and carried to its destination. Similarly if a message is desired to be sent from a station to a moving train, the same simple means are employed, and the current passing through the wire F, is by induction taken up upon the wire running through the tube BB, and thus delivered to the operator upon the moving train.

Fig. 1.

PHELPS' INDUCTION TELEGRAPH SYSTEM.

The system is now in daily practical operation upon the branch of the New York, New Haven & Hartford R. R., extending from Harlem to New Rochelle, a distance of twelve miles, and two representatives of the American Railroad Journal, upon the invitation of the inventor, examined the system thoroughly, both in its construction and operation. Upon entering the car, the apparatus for the transmission and reception of messages was seen situated in one corner of the baggage compartment. It occupies but little space, and closely resembles the ordinary apparatus for the transmission of telegraphic dispatches. After the train had left the Harlem station and was running at a high rate of speed, the following message was dispatched to the office of the Journal: "On

board train 15 New Haven Road. Message sent by Phelps process. Not back to-night. Answer." The operator dispatched the message and in order to secure correctness it was telegraphed back from the receiving station, situated a few hundred feet from the Harlem depot. The inventor has found it advisable to employ the telephone as a means of communicating the message,

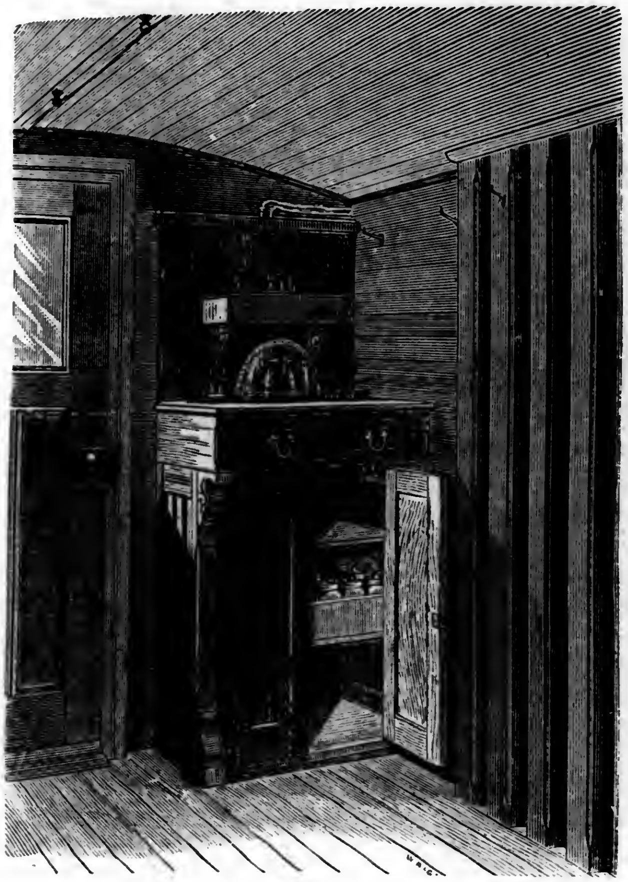
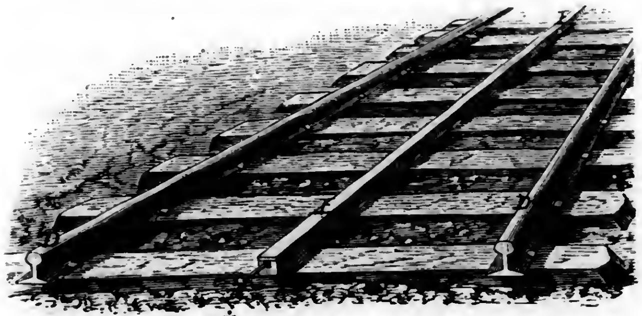


Fig. 2.
PHELPS' INDUCTION TELEGRAPH SYSTEM.

in combination with the usual Morse system, and when the message was repeated it could be distinctly heard with the telephone transmitter held some distance from the ear. It came in the form of the usual "buzzing" so



F Fig. 3.
PHELPS' INDUCTION TELEGRAPH SYSTEM.

familiar to all who have used the telephone, and once again the inventor has made use of a hitherto objectionable feature to accomplish the desired ends. Unfortunately there was not sufficient time for a message to be returned from the JOURNAL office, but the message was delivered thereat within fifteen minutes after its dispatch, demonstrating the reliability and accuracy of the system.

The inventor has provided for every contingency, and nothing appears to have been overlooked in the perfection of his system, though doubtless minor improvements will be introduced from time to time. The wooden trough or tubing between the rails is of cheap and simple construction, and provision is made for bridges, switches and turnouts, by passing the wire through rubber tubing under the crossing rails, and under the draws of bridges. In order to prevent the trough from being injured at highway crossings, at these crossings the wire is passed through a stout iron pipe, and thus preserved from harm.

At the semi-annual meeting of the Association of American Railroad Superintendents, held in Richmond, Va., on April 15th, Mr. Wm. H. Stevenson, the president-elect, read an interesting paper explaining the operation of the Phelps' Induction System, and warmly indorsing it.

The utility of this invention must be apparent, and several roads are already in negotiation for the use of the system. The induction telegraph has been patented, and is now entirely controlled by the Phelps Induction Telegraph Company, of 13 Park Row, New York City.

Miller's Railway Rail-Joint.

ISAAC J. MILLER, Jr., of Cincinnati, O., is the inventor and patentee of a railway rail-joint, which is herewith illustrated and described. It is claimed to be quite dis-

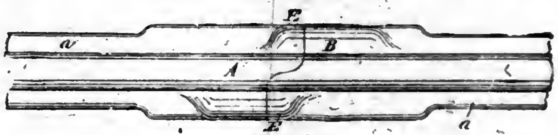


Fig. 1.

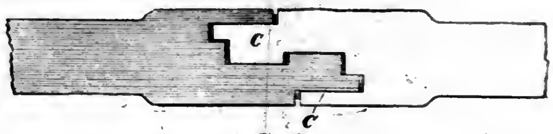


Fig. 2.

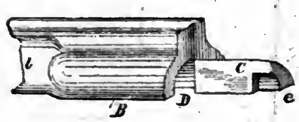


Fig. 3.

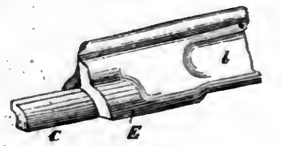


Fig. 4.

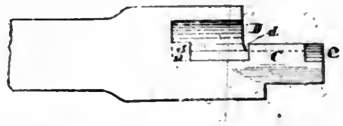


Fig. 5.

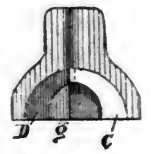


Fig. 6.

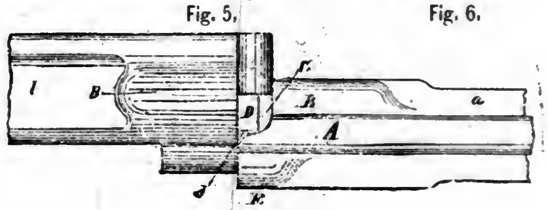


Fig. 7.
MILLER'S RAILWAY RAIL-JOINT.

tinct from any railway rail-joint heretofore patented, and to provide for a continuous rail, firmly interlocked, without the usual transverse openings at the joints of rails. The accompanying illustrations will enable one to understand the inventor's claims, which are as follows:

1. A rail having a flanged mortise formed in the under side of one of its flanges B, at the end of the rail, and a

fitting-tenon projecting from the base of the opposite flange and forming one-half of an interlocking rail-joint, substantially as described.

2. A rail having the tenon C, projecting from the base of one of its flanges, and adapted to interlock with a flanged mortise formed in the flange of an abutting rail, substantially as described.

3. A rail having the flanged mortise D, formed in one of its flanges at the end of the rail, and adapted to receive and interlock with a tenon projecting from the opposite flange of an abutting rail.

4. A rail-joint formed in the rails, consisting, essentially, of the tenons C, and flanged mortises D, formed at the ends of the rails, and adapted to interlock reciprocally each with the other, substantially as described.

5. A rail-joint formed of tenons and mortises attached to and formed in the flanges of the rails, with the web and tread of the rail terminating in two reverse-curved abutting lines upon each side of the center of the tread, substantially as described.

6. A rail-joint composed, substantially, of the tenons C, and mortises D, formed upon the base of the flanges of the rails, of segmental shape, each chiefly outside of the central line of the tread of the rail, and forming an interlocking shoulder *d*, to prevent the end removal of the rails, substantially as described.

7. A rail-joint composed, substantially, of the quadrant-shaped tenons C, and mortises D, and secondary supporting-tenons *g*, and mortises *e*, or their described equivalents, substantially as described.

8. A rail-joint composed, substantially, of one or more tenons C, having a secondary mortise *e*, one or more mortises D, and secondary tenons *g*, adapted to interlock, substantially as described.

9. A joint made by means of one or more mortises and one or more tenons, constructed as described, so that the parts will interlock by turning one rail at an angle to the other and introducing the tenon in the open side of the mortise, substantially as described.

The invention dispenses with the use of fish-plates, bolts and rivets, and the inventor claims that the lock-joint cannot be displaced; that it matters not whether the joint rests upon the cross-ties or occurs between them, and that it is stronger than any other part of the rail.

He claims full provision for expansion and contraction, and, yet, that the rails cannot creep, because the spikes driven in the ties act as locks against the flange at the joints. He claims smooth riding, because the end of one rail cannot be depressed below the end of the interlocking rail, and, in crossing the joint, the tread of the wheel is upon the ends of the two rails at the same instant. That the joint is in itself a truss-support by reason of the little tenons *g*, and the reciprocal mortises *e*, and susceptible of no movement in any direction by the weight or strain to which it may be subjected.

That the rails are easily laid and readily removed when the tenons are in the same flange of the rail, the mortises being in the opposite flange, by simply rolling the rail over as illustrated in Fig. 7, which is done by slightly elevating the ends of adjoining rails and lowering the rail to be removed.

But, while the rails are easily laid when the tenons are in opposite flanges, yet, a single rail cannot be removed, because one end of the rail is constructed to turn one way while the other end is formed to turn in the opposite direction. He claims a great advantage in this manner of laying rails across bridges and in dangerous places or where the track might be maliciously tampered with, because, to remove the rails, the work must commence at one end of the section of track so laid.

The two kinds of rails interlocking, part of the track may be removable and the other part immovable. While a glance at the illustrations might suggest difficulty in laying a track, on account of the accuracy of the joint, yet the inventor says, the tenons commence entering the mortises with sufficient play, filling them as the joint is formed and the rail is straightened with the track. The inventor is open to receive propositions for the manufacture of the rails.

Pearson's Indicator-Lock.

CHARLES and WILLIAM PEARSON, of Webster, N. H., are the inventors of an indicator-lock for use upon railway-cars, steamboats and upon hotel doors, which is herewith illustrated and described. The invention consists of a certain device for preventing the sliding latch

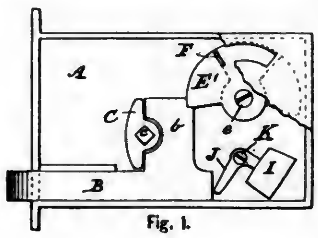


Fig. 1.

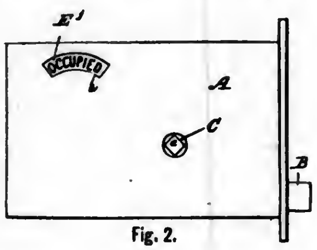


Fig. 2.

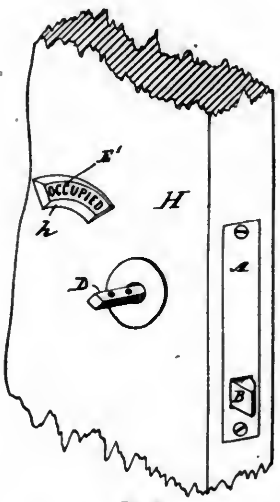


Fig. 3.

PEARSON'S INDICATOR-LOCK.

of a door, or the rocker through which the knob-spindle passes, from being moved or operated by the knob-spindle when a door is closed by any one who may be outside.

In the accompanying cuts, Fig. 1 is a side view of a lock having a portion of the housing broken out, exposing the device; Fig. 2 shows the reverse side of the lock, and Fig. 3 a portion of a door-stile in perspective, having mortised therein the improved fastening.

The case or housing A, is provided with a sliding bolt or latch B, having a finger *b*, against which a rocker C, will rest. This rocker is provided with a square hole *c*,

through its center, into and through which the square knob-spindle D, is passed.

In order that a person within may be able to prevent those outside from turning the knob-spindle and thus gaining entrance, a wheel-section E′, is placed within the case or housing A, hung on a pivot or screw *e*, so adjusted that it may be readily rotated to bear against the back part of the finger *b*, and thus prevent the latch B, from being moved by the rocker C, and knob-spindle D. The wheel-section E′, will be limited in its movement, the distance being determined by a thumb-piece or button F, which may be secured to the part E′, and pass out through a slot *a*, in the housing A, this slot being made the proper length to allow sufficient movement for the wheel-section E′. The slot *a*, will be made on a curve the radial center of which will be the pivot or screw *e*. Another slot may be formed on the opposite side, and conveniently utilized for the display of some such word as "engaged," "locked," or "occupied," as shown in Figs. 2 and 3, for use upon doors in hotels, state-rooms or railway-cars. The word may be so placed upon the wheel-section E′, as to show through a slot *h*, in the outside of the door H, opposite to the slot in the housing, when the wheel-section E′, is placed, as shown by full lines in Figs. 2 and 3; but when the wheel-section has been rotated to the position shown by dotted lines in Fig. 1, the latch B, will be free to move, and may be operated either from the outside or inside of a door by means of the knob, and nothing will be seen in the slot *h*, but the plane surface of the wheel-section E′. The slot *h*, cut in the door H, should be beveled on its sides and ends, as shown in the cuts, and a glass plate may be placed over the slot.

It may sometimes be desirable to be able to lock or fasten a door on the outside, in which case the construction of the part E′, may be so changed that it may be operated by a key. The wheel-section may also be furnished with a notch, as in the case of a bolt, in which the key may operate. The latch B, may be held so as to project outside the door, as shown in the cuts, by some suitable spring; or a weight I, may be attached to a right-angled lever J, fulcrumed at K, and this lever operate against the latch B, and accomplish the same purpose as a spring.

From this description it will be readily seen that the wheel-section E′, serves two purposes—viz., that of an annunciator and a fastening for the latch B.

The patent is now in the hands of the American Patent Agency, of Cincinnati, O.

Sisum's Cable-Railway Grip.

WILLIAM H. H. SISUM, of Brooklyn, N. Y., has recently invented an improvement in grips for cable-railways for elevated or depressed roads, the operation of which is shown in the accompanying cuts. The object of the improvement is to provide in a simple and effective manner for gripping the rope from a car, so that the car will, with slight power, be gradually started and afterward, when high speed is attained, positively connected with the rope.

The maximum of power required upon any given railway in which a cable is used for carrying the motive power, is one sufficient to start from rest into motion all the cars on the line loaded with the average load. To do this with certainty and safety, requires the use of very strong cables, and immense and powerful engines, rendering it commercially impracticable. This grip was designed to overcome that difficulty by multiplying the power at the moment of starting, when it is most needed.

Fig. 1 is a plan of a car-truck furnished with mechanism embodying the improvement; Fig. 2 a longitudinal section of a portion of the same, taken on the plane of the dotted line *x x*, Fig. 1; Fig. 3 a transverse partial section of the same, taken on the plane of the dotted line *y y*, Fig. 1; Fig. 4 a sectional view of a portion of the

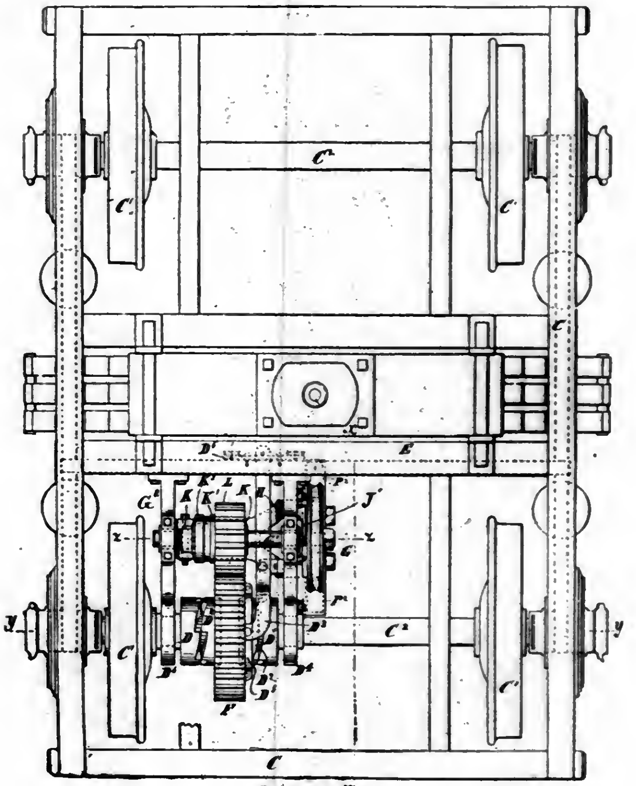


Fig. 1.

SISUM'S CABLE-RAILWAY GRIP.

latter, taken on the plane of the dotted line *z z*, Fig. 1, and Fig. 5 is a transverse section showing certain parts.

A designates rails on which the car travels. They may be of any construction, and laid in the usual or any other approved manner; B an endless rope or cable, which travels between the rails, suitable pulleys being employed to guide it, and any suitable means being used to drive it; C the frame of a car-truck, C′ the wheels thereof, and C^2 the axles of the wheels. The wheels are rigidly affixed to their axles, as is usual in railway-cars. The axles may be journaled in the truck-frame in any suitable manner.

On one of the axles C^2, are rigidly fastened two clutch-pieces D D′, having reversely-arranged ratchet-teeth. Between these clutch-pieces D D′, a clutch-piece D^2, is mounted on the same axle in such manner that it may be slid longitudinally into engagement with either of the clutch-pieces D D′. At its ends the clutch-piece D^2, is provided with ratchet-teeth arranged reversely to the ratchet-teeth of the adjacent clutch-pieces D D′, so that when rotated in either direction it may be engaged with

one or the other of the clutch-pieces D D′, to rotate the same, and consequently the axle to which they are affixed, either one way or the other, as may be desirable.

A lever D^3, is fulcrumed to a fixed bracket arranged on a bar D^4, here shown as supported at one end by a cross-bar E, sustained from the journal-boxes, and at the other by the adjacent axle C^2. One end of this lever is forked or bifurcated, so as to embrace a hoop D^5, which internally is provided with a circumferential groove engaging with a circumferential rib on the clutch-piece D^2. The bifurcated end of the lever is pivotally secured to the hoop by pins or screws passing through it and entering the hoop. The other end of this lever may have com-

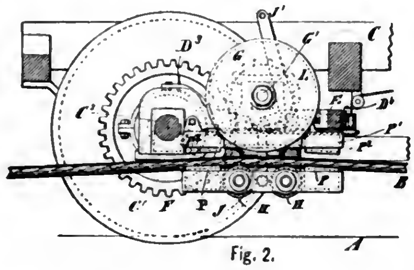


Fig. 2.

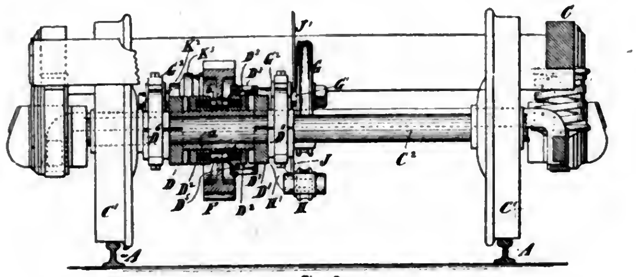


Fig. 3.

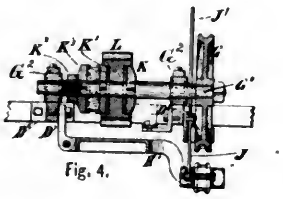


Fig. 4.

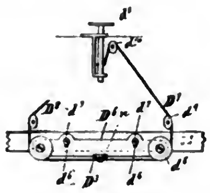


Fig. 5.

SISUM'S CABLE-RAILWAY GRIP.

bined with it any suitable device whereby a swinging or oscillating motion may be imparted to it. By oscillating the lever the clutch-piece D^2, may be shifted longitudinally, and, owing to the manner in which the lever is connected to this clutch-piece D^2, the lever will not interfere with the rotation of the clutch-piece.

F is a gear-wheel, which is arranged on the same axle as the clutch-pieces D D′, and between said clutch-pieces. This gear-wheel is not affixed to the axle so as to turn therewith, but may turn thereon freely. It is, however, connected to the clutch-piece D^2, so as to turn in unison therewith. As here shown, the gear-wheel has a long hub *a*, extending from each side of it. The clutch-piece D^2, is made in two sections, arranged on the hubs one on each side of the gear-wheel, and bolts *b*, extend into the two sections of the clutch-piece and pass loosely through the gear-wheel. In effect, therefore, a single clutch-piece D^2, is made, having two sets of ratchet-teeth, and although it is arranged directly upon the hub of the gear-wheel, yet it is indirectly supported by the axle upon which the gear-wheel is arranged. These parts may be combined in other ways to attain the same result.

G designates a grip-pulley, which is rigidly affixed to a shaft G′, journaled in bearings G^2, erected one upon the bar D^4, and another on a similarly-supported bar D^6. It will of course be understood that the bars D^4 D^6, are supported on the axle C^2, in such manner that they will not interfere with the rotation of the latter.

H designates grip-pulleys arranged so that they will be approximately in the same vertical plane as the grip-pulley G, and having their shafts supported at both ends in a bar carried by a lever H′, that is hung on a bracket D^7, extending from the bar D^6, as shown in Fig. 4. If necessary, the bearing of the pin which connects this lever to the bracket may be elongated to prevent the pulleys from being moved materially out of the plane of the pulley G, when the lever is swung or oscillated. The lower end of the lever H′, is connected by a link J, to a bell-crank lever J′. The lever J′, is fulcrumed to the bar D^4, and may have its upper end fastened to a cord or chain connected with a windlass. The turning of the windlass will then operate the lever and cause it to raise or lower the lever H′. When the lever H′, is raised, the pulleys H, will be drawn up into a position in which they will bear tightly upon the endless rope or cable and cause the latter to bear forcibly against the pulley G. The lever H′, will descend by gravity when the pull or strain on the lever J′, is relaxed.

The shaft G′, has mounted on it a gear-wheel L, that engages with the gear-wheel F. The gear-wheel L, is not rigidly secured to the shaft G′, but is clamped thereto by friction-plates K K′, which are locked on the shaft so that they will turn therewith. One of these friction-plates K, abuts against a shoulder on the shaft, and the other K′, is free to slide lengthwise to the shaft. The plate K′, may be forced toward the plate K, by a nut K^2, screwed on the shaft and acting against a plate K^3. Between the plate K^3, and the plate K′, is interposed a piece of india-rubber or analogous material. The plates K K′, are faced with leather or like material. By manipulating the nut K^2, the wheel L, may be secured more or less forcibly to the shaft G′. The wheel L, can be allowed to slip on the shaft under very severe strains. On the bar in which the rollers H, are supported are fixed grippers P, and on a bar P′, above the former bar, are affixed corresponding grippers P^2. The bar P′ may be secured to the bar D^4. The grippers P P^2, may be made of wood or like material, or metal.

To cause the car to derive motion from the endless rope or cable, the clutch-piece D^2, is shifted into engagement with the clutch-piece D, and the lever H′, is canted to cause the pulleys G H, to grip the endless rope or cable. The grip-pulleys will then be caused, by the rope or cable, to rotate. Thereupon the gear-wheel L, transmits motion through the gear-wheel F, to the axle on to which the gear-wheel F, is affixed. The grip-pulleys continue to act in this way until the gear-wheel F, has acquired its maximum speed. When this gear-wheel has attained such speed, it rotates with sufficient rapidity to cause the clutch-piece D, to move faster than the clutch-piece D^2, whereupon the clutch-piece D^2, will be thrown out of engagement with the clutch-piece D. The motion of the car will have been gradually augmented, so that by this time its momentum will be such that its drag on the rope or cable will be insufficient to cause the rotation of the grip-pulleys. The lever H′, may now be swung up

still further, to cause the grippers P^2, and the grippers P, to grip securely the rope or cable.

When the car is to be stopped, the lever H', will be lowered, and brakes of the usual or any suitable kind are applied to the wheels of the car. When the car is to be propelled in the reverse direction upon another portion of the endless rope or cable moving in the opposite direction to that of the portion to which the car was formerly fastened, the clutch-piece D^2, is shifted into engagement with the clutch-piece D', and the lever H', is raised to cause the endless rope or cable to be gripped, as before.

D^6 is a latch-bar, whereby the lever D^3, is normally kept in such position that the clutch-piece D^2, will be maintained by it out of contact with the clutch-pieces D D'. The latch-bar has at or about its middle a notch *n*, which, when the bar is in a horizontal position, engages with the lever D^3, and thus secures it in position. The latch-bar is provided with approximately-vertical slots d^6. Screws d^7 pass loosely through the slot d^6, and enter the bar E. The latch-bar is therefore hung on the screws d^7, in such manner that either end may be raised, the latch-bar meanwhile turning on the screws d^7, which is the further from it. When either end of the latch-bar is thus elevated, the notch *n*, of such bar will be disengaged from the lever D^3, whereupon the latter can be shifted.

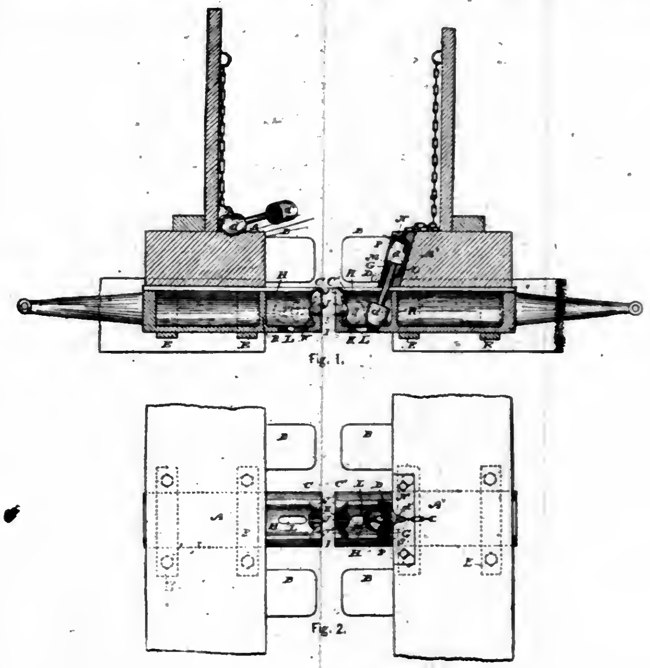
Provision is made for raising the latch-bar D^6, and shifting the lever D^3, by one motion. D^7 is a cord or equivalent device, which is secured at one end to the lever D^3. From the lever D^3, it passes around a pulley d^8, on one end of the latch-bar, thence around a pulley d^9, which will be supported on a fixed part of the car-truck, thence around another pulley d^{10}, arranged on the car-truck, and is finally attached to a push-piece d^{11}. By depressing the push-piece d^{11}, the latch-bar will be raised and the lever D^3, pulled over. A cord D^8, passes from the other end of the latch-bar around pulleys to another push-piece, whereby the last-mentioned lever may be operated. After pressure is removed from the push-pieces the latch-bar can descend to its normal position.

When the clutch-piece D^2, is thrown out by either of the clutch-pieces D D', the lever D^3, will be swung into a central position, and then will engage with the notch *n*, of the latch-bar.

Leech's Car-Coupling.

JOHN F. LEECH, of Allegheny, Pa., is the inventor of an improved car-coupling, which is herewith illustrated and described. It consists of two similar cylindrical draw-heads and a removable coupling-bolt. The cylindrical draw-head is suspended from the bottom of the car in the usual way. When the cars come together, the two draw-heads, which on all rolling stock project somewhat beyond the buffers, meet and yield to the motion of the cars until the coupling-bolt resting in one draw-head is automatically, by concussion and retreat of the draw-head, thrown into place in the other draw-head and the coupling is completed.

The draw-head consists of a cylinder having on top a longitudinal slot of sufficient size for the reception of the enlarged head of the coupling-bolt, and a smaller slot extending from the edge to below the center of the cylinder-head, perpendicular to and communicating with the upper longitudinal slot. In size it corresponds to that of the shank of the coupling-bolt. A section of a sphere projects from the center of the head-plate on the inside, through which the slot in the head-plate is continued. The draw-head is provided with the usual drainage-opening. The coupling-bolt consists of a shank having at each end an enlarged head concave on the inner side, so as to fit over the hemisphere on the inside of the draw-head, thus forming a ball-and-socket joint. In coupling, the bolt is dropped by means of a chain attached to one



LEECH'S CAR-COUPLING.

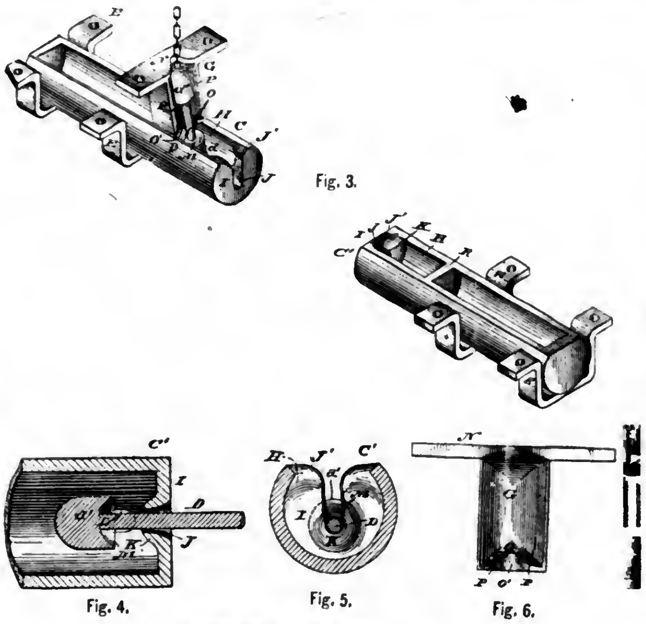
end of it into the large slot of the draw-head, where it remains in a more or less perpendicular position, one head resting against the bottom of the draw-head, the other in a pocket provided for it immediately above the draw-head in the cross-beam of the car-platform.

In the accompanying cuts, Fig. 1 is a view in section of the two draw-heads and bolt prior to coupling, the position of the pin when coupled being indicated in dotted lines; Fig. 2 a top plan of the same; Fig. 3 a view in perspective of the draw-heads and bolt in place for coupling; Fig. 4 a view, partly in section, of the bolt; Fig. 5 a plan view of the inner side of the head-plate of the draw-head in detail, and Fig. 6, a view of the receiving-pocket for the bolt-head.

A A' are the car-platforms, B B B B the buffers, C C' the draw-heads, and D the coupling-bolt. E E are brackets by which the draw-heads C C', are suspended from the bottom of the car, and G G' the receiving-pockets for the head *d'*, of bolt D. In draw-head C, H is the upper longitudinal slot for receiving the head of bolt D. I is the head-plate, having the slot J, flaring at the top J', where it joins slot H, so as to guide pin D, more readily into place. K is the section of the sphere projecting on the inner side of the head-plate. L is the drainage-hole of the draw-head. M is the concave inner surface of the bolt-heads *d d'*, which conforms to the periphery of ball K, but does not completely cover the surface of the ball in order to allow for the play of the bolt. The pocket G, placed immediately above draw-

head C, consists of top plate N, the downward flaring bottom plate O, notched at O′, to receive the shank of the bolt and the sides P, which also flare outwardly. The face of the pocket is not perpendicular, but inclined, the bottom projecting beyond the top to assist in guiding and retaining and impelling the bolt into place.

Draw-head C C′, may be provided with a terminal plate R, or the plate may be dispensed with, or the cylinder beyond the end of slot H, may be contracted to a lesser diameter, to facilitate its casting. The draw-head is materially reënforced at the top on both sides by concave shoulders S S, which also serve to guide the bolt home. It is also preferable to make the draw-heads cylindrical, as greater strength is obtained thereby, although they may be varied in shape without departing from the spirit of the invention. The brackets by which the draw-heads are suspended are preferably made square, as shown in the drawings, which greatly decreases the friction where a cylindrical draw-head is used. Pocket G, is also made in one casting. The shape of the bolt-head is preferably that shown in the drawings, being that of a truncated cone with the top rounded off; but the particular shape of the bolt-head is not essential so long as it is provided with an inner concave surface such as described.



LEECH'S CAR-COUPLING.

The operation of the device is as follows: The brakeman having dropped the bolt D, into place by means of the chain attached thereto, it rests with head *d*, in the drainage-slot L, of draw-head C, and head *d′*, in pocket G, the shank of the bolt being held in the notch O′, at the bottom of the pocket. When the cars come together, the draw-heads C C′, are the first opposing points to meet and retreat beneath the car in the usual manner. The forward impulse thus given to the top of the bolt by the retreat of the lower end, as well as conveyed to the head resting in the pocket, throws head *d′*, out of the pocket G, and, guided by the shoulders S S, and the flare of the slot J, causes it to fall into the slot H, of draw-head C′, the head *d*, still remaining in draw-head C. When the train starts, the bolt-heads are drawn up against the balls K K, on the head-plates of the draw-heads and the coupling is completed. To uncouple, the bolt is removed by means of the chain, and is left hanging to the car when not in use.

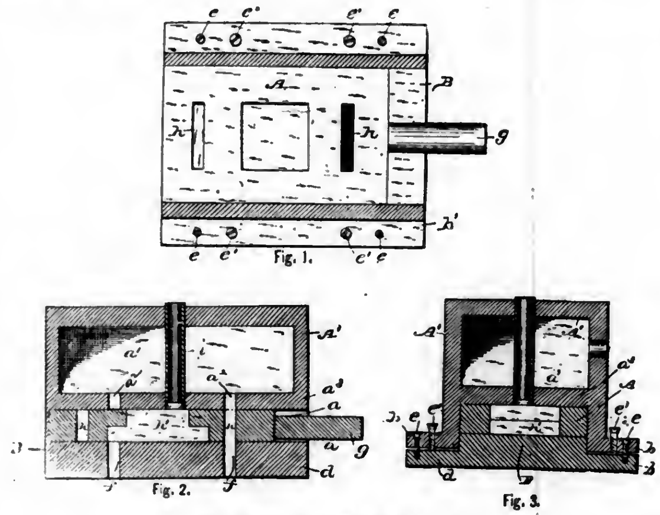
The ball-and-socket joint allows of sufficient play of the bolt while the bearing is kept up over all the surface of the socket and ball whatever the angle given the bolt. Cars of different heights may thus be coupled with great facility and security, this point being one of the most important in all couplings. Instead of spreading the slot, and with it the head-plate and draw-head, the greater the pull the more firmly the two halves of the head-plate are bound together.

The whole device is simple, of easy adjustment, and not liable to get out of order.

McKinnis' Steam-Valve.

WM. C. MCKINNIS, of Red Bluff, Ark., has recently invented an improved steam-valve, whose construction and operation are shown in the accompanying cuts. The chief objects of the invention are to reduce friction to a minimum, to effect the adjustment of the parts to take up or compensate wear, and to promote simplicity of construction.

Fig. 1 is a horizontal section of the improved slide-valve; Fig. 2 a longitudinal section, and Fig. 3 a cross section of the same.



MC KINNIS' STEAM-VALVE.

The chest A′, is subdivided into the valve-chamber *a*, and the steam-chamber *a′*, the latter communicating with the valve-chamber by openings a^2, made in the dividing plate or partition a^3, between the chambers. The normally lower longitudinal edges of the steam-chest A′, are provided with flanges *b*, which are connected to the cylinder-plate *d*, by screws *e e*, at the corners, which plate, inside of the chest, is thickened up to form the valve-seat B, having steam-ports *f f*, through it.

Intermediately of the screws *e* are passed through the flanges *b*, additional adjusting-screws *e′ e′*, which do not, however, pass through the cylinder-plate *d*, but bear thereon, and are turned in the opposite direction to that in which the fastening-screws *e e*, are turned, whereby it will be observed that with the valve seated upon the elevated or thickened upseat B, (permitting the lower edge-flanges of the chest A′, to stand off normally from the cylinder-plate,) upon the wearing away of the valve and

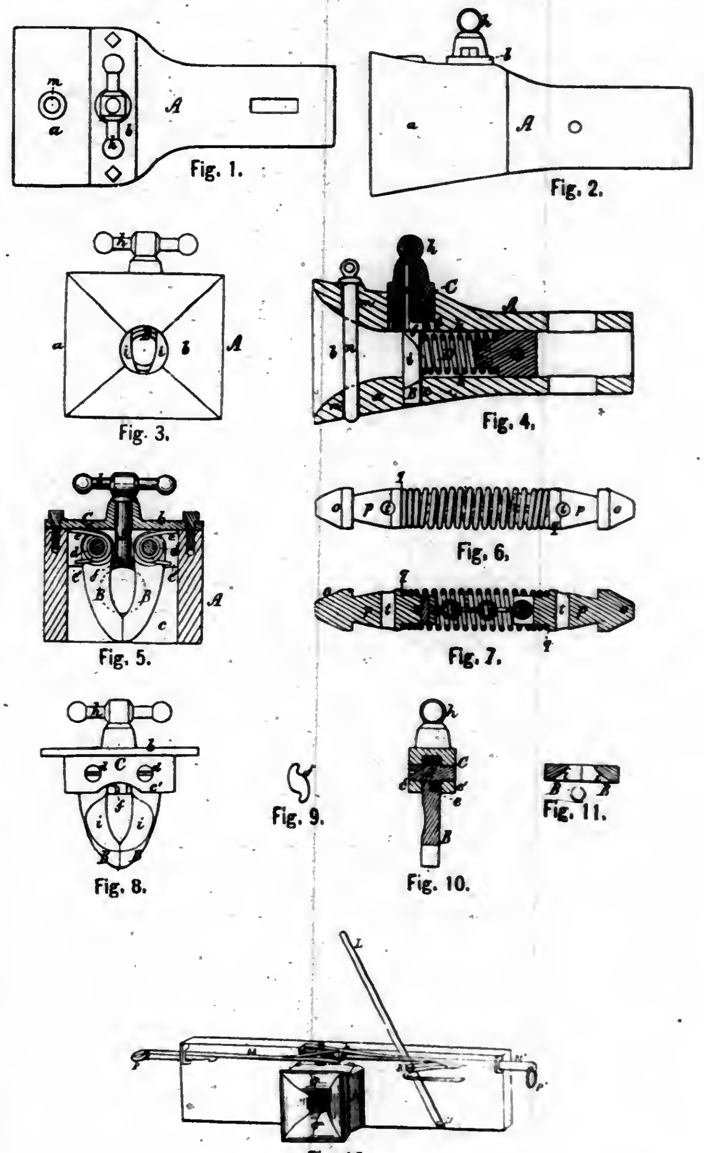
its seat, the wear can be readily compensated, the screws e, being tightened or turned to the right, while the screws e', are turned in reverse direction. The valve A, is disposed in the chamber a, of the steam-chest A′, and is provided with the usual stem g. The valve A, is provided with live-steam ports h h, and the intermediate exhaust-steam port h'. The live-steam ports are arranged well toward the ends of the valve, while in one side of the valve, the side next to the cylinder-plate or cylinder, the exhaust-steam port is of such length that when one of the live-steam ports is admitting steam to one side of the piston of the cylinder that end of the exhaust-steam port most distant from the live-steam port will be exhausting into a central pipe i, arranged to extend vertically through the chamber a', of the chest A′; or it may in practice exhaust directly into the chamber h', from which the exhaust-steam may be discharged through a pipe leading to a point below. The valve and steam-chest are designed to be long in proportion to the length of the cylinder, in order that the live-steam ports h h, may be short and economical in the use of steam, the friction of the valve not being increased by its length. Its length can be accommodated to any old valve-seat with great saving as to friction. The chest and valve can be used at the side as well as at the top of the cylinder. The valve can also be made self-adjusting by the use of metallic spring packing. It can also be used in practice with metallic or steel-spring packing.

The steam-chest and adjusting flanges are cast in one piece, and no bolts are employed save those used to secure it in position and adjust its lost motion, if there be any, while the ends of the valve-chamber may be closed with movable covers to exclude dust. It may be stated that the valve operates as effectively with ends exposed, as in case of their being closed, and any waste of steam can readily be detected.

Andrews' Car-Coupling.

JOHN S. ANDREWS, of Milltown, New Brunswick, Canada, is the inventor of an improved car-coupling, the operation of which is illustrated in the accompanying cuts. Fig. 1 is a top view, Fig. 2 a side elevation, Fig. 3 a front end view, Fig. 4 a longitudinal section, and Fig. 5 a transverse section, of the coupler, and Fig. 6 is a top view, and Fig. 7 a longitudinal section, of a shackle to operate with the coupler. Fig. 8 is a front elevation of the jaws and their support-piece, and Fig. 9 an under side view of the cam for opening the jaws. Fig. 10 is a vertical and transverse section of one of the jaws and its support-piece, and Fig. 11 a transverse section of the two jaws, showing the manner in which each jaw is beveled to receive the conical head of the shackle. Fig. 12 is a front view of the draw-head, showing an improved device for operating the coupler from the top or side of the car.

A is a draw-bar, having to its bunter or head a, a tapering mouth b. Directly in rear of such mouth, and in a narrow chamber c, in the draw-bar, there are arranged a pair of curved jaws B B, and the support-piece C, to which each of such jaws is pivoted. This support-piece is composed of a plate b, and two flanges c' c', extending down therefrom parallel to each other, they being at a proper distance apart to receive between them the upper portions of the jaws, through which portions and the flanges the pivotal screws d d, of the jaws extend and screw into one of the flanges. Each jaw is provided with a spring e, suitably applied to it and the support-piece, designed for forcing the jaw toward its fellow. Between the two jaws there is arranged an S-shaped cam f, for moving them asunder, such cam being fixed on the lower end of an upright spindle g, journaled in the support-piece at its center, and extending above it, and provided with a



ANDREWS' CAR-COUPLING.

handle h. Each jaw is beveled or inclined from its outer to its inner edge, as shown at i. The support-piece is inserted and fastened within the draw-bar head, and there is directly in rear of the support-piece a cylindrical chamber k, which, formed in the draw-bar, contains a spiral spring D, which is to act as a bunter to the shackle-head on its passage between the jaws, and to expel it therefrom on their being opened for discharge of the shackle. In front of the support-piece there is extending down through the head of the draw-bar a hole m, for reception of a pin n, to enable the draw-bar, when necessary, to be connected to another adapted to receive a common shackling-link.

The shackle for use with the coupler, as described, has two conical heads o o, projecting from the smaller ends

of the two conically-shaped bodies *p p*, connected by a chain *r*, and having between them, and extending from one to the other, a spiral spring *s*, into which, at its ends, the bodies *p p*, are extended, as represented. The ends of the spring rest against shoulders *q*, formed in the bodies *p p*. Furthermore, there is in each of such bodies a hole *t*, which goes diametrically through the body, designed to receive the pin *n*, when the shackle is connected with the draw-bar by the pin, and not by the jaws. The two bodies of the shackle may be joined by a rigid connection or bar, instead of by yielding ones—viz., the chain and spring, as described; but with these latter the shackle can readily bend laterally should it be borne against one side of the mouth of the draw-bar while the cars may be running on a curve of the railway-track. On the shackle being driven endwise into the head of the draw-bar and between the jaws, it will force them apart and pass between them, after which they will close upon it in advance of the conical head that may have so opened them. In so closing upon the shackle they, with the head, will couple it to the draw-bar.

To set the shackle free, the cam *f*, is to be partially revolved, so as to force the jaws sufficiently apart for the spring D, to expel the shackle from the draw-bar, this spring having been contracted by the shackle in its passage into the draw-bar for being coupled therewith. The spring D, also serves to aid in supporting the shackle in a horizontal position, in order for it to be properly presented to engage with another draw-bar.

In Fig. 12 is shown a device for operating the coupler from the top or side of the car. L is a lever pivoted at N, to the front of the car, and hinged at R, to a short rod, which is in turn hinged at S, to a rod M, which is attached to the handle *h*. By moving the lever L, the handle is made to turn the cam *f*, which opens the jaws. Similarly the rods M M′, provided with the ring-handles P P′, afford a means for operating the device from the sides of the car.

Armstrong's Automatic Car-Brake.

MARTIN ARMSTRONG, of Milan, Kans., is the inventor and patentee of an automatic car-brake, which is herewith illustrated and described. It is claimed by the inventor that the brake may be applied to cars as an auxiliary or safety brake, with but slight change of parts, and that it may be placed instantly in operation, exerting a much greater force than could be given by a brakeman.

In the accompanying cuts, Fig. 1 is an elevation, partly in section, of an ordinary freight-car with the improvement attached, the new features and the ordinary brake mechanism being in elevation; Fig. 2 a perspective of the cramp-weight and its connections, located upon the top of the car; Fig. 3 a perspective detail of one of the car-axles, showing the operating-cam; Fig. 4 a detail view of the oscillating pawl-lever, to which the dog which operates over the axle-cam is pivoted, the view being taken at right angles to the position shown in Fig. 1; Fig. 5 a detail side view of the trip-lever and its connections with the operating-pawl; Fig. 6 an enlarged detail view of one of the jointed pawls, and Fig. 7 an enlarged view of the principal novel features detached from a car, including the trip-lever and its connections with the jointed pawls, the pawls, the ratcheted brake-bar, the oscillating lever, and its dog.

A designates the body of a freight-car; B designates the brake-shaft; *b* the chain; B′ the brake-bar, and *b′* the brake-lever. These parts are of ordinary and ap-

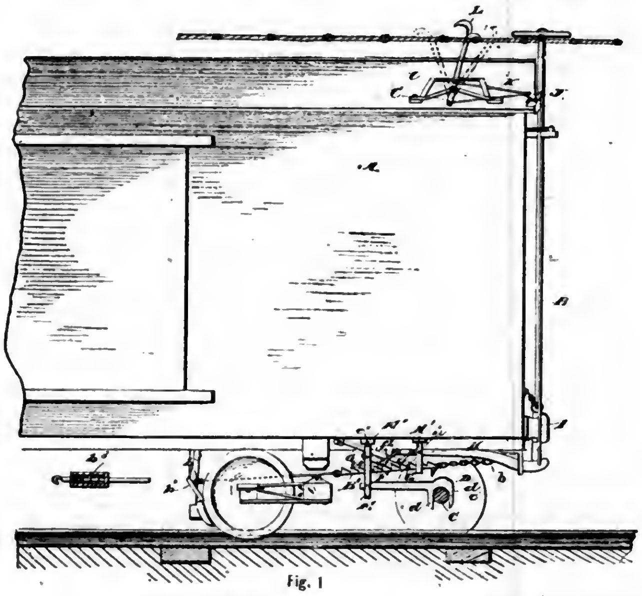


Fig. 1

ARMSTRONG'S AUTOMATIC CAR-BRAKE.

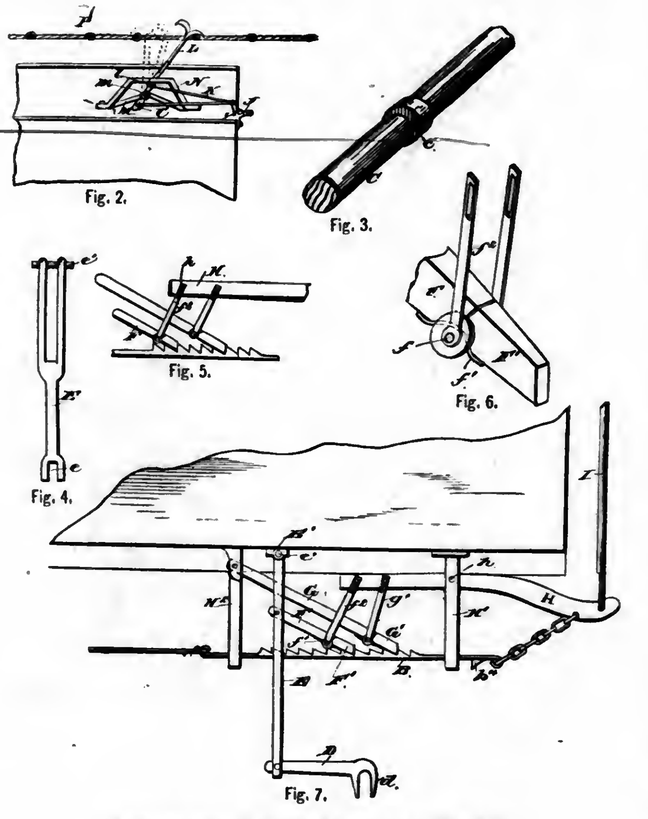
proved construction, except that the brake-bar B′, is provided with ratchet-teeth upon its upper side, and moves in suitable guides, and that the flexible connections are provided with a cushioning-spring, as shown at b^3. This rack-bar B′, is an important feature of the invention, being the point at which the auxiliary self-acting brake system combines and connects with the ordinary hand-brake devices now in use. Hence by removing the ordinary brake-bar and substituting the rack-bar B′, in its place, and providing such proper guides that the bar will be only capable of longitudinal movement, the invention may readily and at small expense be applied to freight-cars now in use.

Upon one of the truck-axles C, is secured an eccentric *c*, and with this eccentric is engaged a dog D, which is pivoted between the bifurcated arms *e*, of an oscillating lever E, pivoted to a block E′, upon the bottom of the car. The dog D, has a jaw *d*, which embraces the cam *c*, and it is held by its gravity in constant engagement therewith, giving to the lever E, a complete forward and backward oscillatory movement from its pivot with each revolution of the axle. The upper portion of this lever E, is bifurcated, both the upper duplex extremities being held by the single bolt *e′*, and in the recess formed between the two arms is pivoted at e^2, a pawl F, hinged at *f*, and having a spring *f′*, as shown, to hold the hinged arm F′, normally in a plane with the body of the pawl. This pawl F, being pivoted upon a bolt having bearings upon either side, is susceptible of a forward and back movement only, its free end traveling, when in operation, upon the toothed face of the brake-bar B′, and when out of operation being suspended directly above the same.

From the pivot of the hinge between the parts F and F′, which constitute the operating-pawl, a yoke f^2, extends upward, and is secured to the free or inner end of a trip-lever H, pivoted at *h*, in duplex frame H′, which is secured to the bottom of the car and extends downward,

having its lower ends connected by a cross-bar. Through this frame H′, the brake-bar B′, operates, and it serves as a guide therefor, as well as a stop to limit the longitudinal movement of the bar in one direction when a tooth b^4, upon the lower side of the brake-bar comes into contact with the cross-bar. The trip-lever is so arranged that its pivotal point is considerably away from the center, leaving its heavier end away from the pawl F, and the gravity of this heavier end is sufficient to raise the pawl F, out of engagement with the brake-bar B′ when the parts are in their normal position. The operation of the parts thus far described will be obvious. The normal condition of the operating-pawl is out of engagement with the brake-bar, as it is held by the gravity of the trip-lever, and the lever E, is continually but idly oscillated when the car is in motion by reason of the dog D, with the eccentric *c*.

H^2 designates another frame, similar to the frame H′, before described, and between its vertical arms is pivoted a holding-pawl G, having a hinged arm G′, and spring *g*,



ARMSTRONG'S AUTOMATIC CAR-BRAKE.

similar to the operating-pawl F. The pawl G, extends beyond the throw of the pawl F, and it is also connected to the inner end of the trip-lever by a tie *g*′, which extends from this lever to the hinge-pivot between the parts G and G′. The normal position of this pawl also is out of engagement with the brake-bar, as it is held by the gravity of the trip-lever. If, then, this gravity is overcome, it is obvious that the pawls F and G, would be thrown into engagement with the teeth of the brake-bar, and that at every revolution of the car-axle the pawl F, will throw the brake-bar one tooth forward, the holding-pawl G, will engage and hold the slack thus taken up, the pawl F, will retreat and engage the next tooth and again thrust the brake-bar the distance of one tooth, which will again be held by the pawl G, and so on until the last tooth has been engaged by the pawl, and it idly reciprocates upon a smooth portion thereof. By this means the brake is placed very powerfully into engagement with the truck-wheels, and will remain so until the gravity of the trip-lever again asserts itself and "knuckles" the pawls F and G, out of engagement. It will be understood that the brake-bar, the brake-shoes, and their connections are so conditioned and proportioned that the maximum or necessary brake force is applied when the last tooth of the brake-bar has been acted upon by the operating-pawl.

To the weighted end of the trip-lever H, is secured a tie-rod I, which, extending vertically, has its upper end secured to an elbow-lever J, pivoted to the upper edge of the car, and having its other arm loosely secured to a tie-rod K, which connects the elbow-lever J, to different points on a cramp-lever L, pivoted at *m*, to a frame M. A quadruped frame N, surrounds and is fixed above the frame M, and it has a recess in which the cramp-lever works loosely, and a bearing upon either side of the center, against which it rests. The upper end of the cramp-lever is weighted, so that as it passes upon either side of the pivotal point its gravity will impel it to its bearing, and hold it in that position until the lever is thrown past its center upon the other side. The tie-rod K, may be attached to the cramp-lever L, at *l*, above the pivot *m*, or at *l*′, below the pivot, so that a single motion of the rope P, will operate the brake properly, whichever end of the car is forward.

When in the position shown in full lines in Figs. 1 and 2 the heavier end of the trip-lever H, is elevated, and when in the position shown in dotted lines the trip-lever assumes its normal position and the pawls F and G, are held out of action, the gravity of the cramp-lever being sufficient to overcome that of the trip-lever. A spring or other proper means may be employed to prevent the accidental displacement of the cramp-lever.

The upper end of the cramp-lever is slotted or otherwise conditioned to receive a knotted rope P, which may be either operated by the engineer or automatically by the separation of the train, to throw the brake mechanism "on." This rope P, may be arranged to work in various ways—for instance, it may be reeved from the engine through or connected with all the cramp-levers and back, so that the engineer may operate it in either direction.

The cramp-levers may be connected with the ordinary brake-shaft B, and other modifications may be made without departing from the principle or sacrificing the advantages of the invention.

If one end of the car is forward, the tie-rod K, will have to be connected at the point *l*′, in order to have a "pull" motion overcome the gravity of the trip-lever, while if the other end of the car is forward the tie-rod will be connected t the point *l*, for the same purpose.

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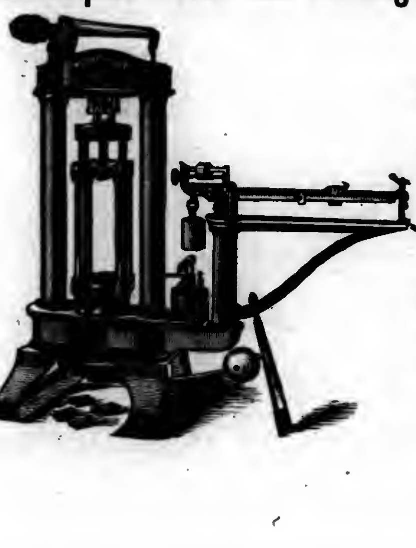

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American Railroad Journal.

WHOLE No. 2,564.] NEW YORK, MAY, 1885. [VOLUME LIX.—No. 2.

A CHAPTER ON RAILWAY ECONOMY.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

THERE is little risk in saying that there is nothing in this world less understood than the true inwardness of economy. It is not economy to save a dollar when it costs $1.50 to accomplish this saving, and yet this is the method that is practiced to a great extent by individuals and corporations. To a certain degree a little false economy is admissable, but this applies to individuals who undertake to do business with limited means and with a hope to make things more substantial and safe in the near future. It is vastly different with a corporation that has unlimited means and uses inferior material because it can be bought for a merely nominal sum as a matter of economy. Too much economy has been the death of more people than were destroyed in Buddensiek's buildings, and some of our American railways have been great sufferers by it.

Some years ago it was considered economy to use steel rails in place of iron and that was true. For a time we had good, honest steel rails and they were durable and safe, and notwithstanding their excessive cost, it was considered economy to use them. But after a time the ingenious rail-maker discovered a way to work in slag and cinders and make a steel rail much cheaper than a good iron rail could be made for. The rail-makers could hardly be blamed for this, inasmuch as railway officials refused to pay a good price for a good article, but gave contracts to the lowest bidder regardless of quality. Not long ago a gentleman was negotiating for a position as superintendent of a rail-mill, when he was questioned very closely as to the amount of slag he could work into a steel rail. The desire to manufacture shoddy railway material did not originate with the manufacturers. The railway officials, by their refusal to pay fair prices for honest, good material, have forced manufacturers to make use of all the tricks known to the trade and to invent new ones, and this has been practiced to such an extent that the steel rails now coming into general use are far inferior to third-class iron rails.

Steel rails are put forth in all the railway advertisements as an element of safety, and people embark on a steel-rail track with a feeling of security; whereas if they knew they were riding on an iron-rail track, they would feel decidedly uneasy and unsafe. The truth is, broken rails are becoming more frequent, while we should reasonably expect that accidents from broken rails would diminish as steel rails are put in use. A poor steel rail is not as good as any kind of an iron rail, and the economy that supplies them is very thin. It is rather expensive to provide good, honest rails, but it does not cost nearly as much to lay a track with good rails as it does to fish a train out of a ditch every few days.

And aside from rails, there are other fixtures and appliances that are of very inferior quality purchased under the same false economy that inspired the purchase of shoddy rails. I have examined piles of broken rails, links, pins, wheels and axles and have never been able to discover a fracture in good, honest material. It is true that defects will escape the watchfulness of the most vigilant inspectors, but the failures of good, honest appliances are rare. I have seen piles of new links and pins that were made on contract at ruinous prices for good material. I have taken links and pins out of these piles, and with a single stroke aross an anvil broken them like a piece of cast iron. The business of the manufacturer was to deliver them and get his pay for them, and the quality corresponded with the price.

Some railway officials plead poverty as an excuse for providing cheap material. This reminds me of what Horace Greely said in a speech at an agricultural fair. He said that a wealthy farmer could afford to do some very slovenly farming, but a poor man could not. The idea was that the wealthy man would not suffer by his indiscretion, whereas a poor man would get poorer by reason of his slack attention to business and slip-shod way of doing it. When we find a successful business man we naturally think that he gets the best the market affords. Why do not corporations do the same and get the best? The motto should be with every railway official, "Get the best."

There is no place where folly is more exempified than in the purchase of railway supplies. Too much legislation is not good, but we, the people of the United States, wish to have it enacted that no railway or other corporation shall build or operate any road unless constructed with good, honest material. The worst economy in this world is buying poor railway material, and the most successful roads are those that have always been thorough in their equipment and repairs.

There is nothing that will put a railway into the hands of a receiver sooner than a thorough practice of the kind of economy under consideration. Look into a keg of spikes, bought at less than bottom prices, and you will see many of them without heads and more without points; many of them burned in two, and but very few in a keg will stand driving, and if they do the heads soon break off and they become worse than useless. Splice-bars and bolts of inferior quality are purchased at low rates, while cheap and dirty lubricants cause hot boxes, cutting of expensive bearings and trouble generally; cheap wheels, cheap axles, cheap running-gear and brakes, cheap fuel, cheap bridges, cheap ties and drainage, cheap pegs and switch-fixtures, cheap and overworked enployés and operatives and cheap everything, all of which have, combined, produced nearly all the seri-

ous railway accidents on record. "Failure of track and equipment" is the verdict in a large share of the accidents that are recorded, and it is safe to say that 90 per cent. of all railway accidents are the result of too much so-called economy.

Not long since the writer was in coversation with a railway official and the former mentioned the fact that some roads which he named rarely met with an accident, while others were always in trouble. "Yes," said he, "the roads you mention are abundantly able to use first-class material and keep everything in first-class condition which prevent accidents." Now the fact in the matter is that the roads named as free from accidents were as poor in their early days as any roads in the country, but the managers thereof made it a rule to get the best, and preferred to pay liberally for safety appliances rather than drain their treasury on damage accounts. It is not the amount of traffic that fills the till so much as the amount saved by preventing accidents.

Any one who will take the pains to look into the financial condition of American railways and get a correct history of their management, will not fail to notice that those that are the most popular and pocket the largest percentage of earnings, are those that have been kept in the best possible condition for safe traffic regardless of expense. He will also notice that the roads that furnish shoddy material and are impoverished by the disasters resulting therefrom, have a weakness for costly private palace-cars for the officials, and thus with railways as with individuals, poverty and style go hand in hand. It is time a reform was inaugurated in this matter and some *genuine economy* practiced. We have had too much false economy and want a change.

THE QUESTION OF SPEED.

BY LAWRENCE T. GOFF.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE conditions upon which depends the attainment of high velocities on our railways, are numerous and varied. Much, it is true, remains to be done in the improved construction of locomotives especially adapted for high speed, and the question broached by a recent contributor to the JOURNAL relative to the re-introduction of inside-connected locomotives is one that may be profitably entered into and discussed; but the uninitiated are greatly mistaken if they imagine that with the solution of the question of the proper construction of engine the problem of high speed has been solved. There yet remain the equally important questions as to conditions of track, gradients, the population of the territory crossed, the amount of travel over the line, the frequency of stoppages, and a number of less important but equally relevant matters, without the due consideration of which high speed as a constant every day factor in railway management becomes impossible.

Given an engine capable of pulling an ordinary train of passenger-cars at a uniform rate of sixty miles an hour, and it is evident that the other conditions will render such a speed impossible save for short distances where the obstacles in the way of reaching the maximum speed are not present; but such sections of track are rare, and it is a safe estimate upon a reduction of twenty-five per cent. from this maximum. In a similar ratio it is also safe to assume that under ordinary conditions of travel the steady average of speed attainable by any train is twenty-five per cent. less than the actual capacity of the engine under conditions that could be deemed perfect. Probably in actual practice a still greater reduction is experienced.

Thus we see that the question of motive power is but one of a number of questions entering into the attainment of high speed, and it is not only the locomotive-builder who has to solve the problem, but the chiefs of every department of railway construction and management.

Smoothness of track and absence of grades are matters for the track-constructors to consider, and in thinly-settled districts the conditions of permanent way are of the highest importance to the attainment of high speed for long distances. Possibly it is common for track-constructors to lay their rails with the greatest care in the streets and roads of towns and villages; but while not arguing against this scrupulousness in regard to the thoroughness of work at populous points of a road, it is evident that so far as the mere question of speed is concerned it is of less importance that the track should be smooth and free from grades in towns and cities than in the outlying districts; for trains are compelled to move with comparative slowness through thickly-settled points. No matter how perfect the conditions for reaching high speed may be, there will always be a loss encountered in traversing cities, unless the railway should pass through tunnels and cuttings, or over bridges, thus avoiding the crossing of streets and roads on a level, which avoidance is not universally the case.

The amount of travel over the ordinary double-track road has also an important bearing upon the attainable speed. A heavy freight business will undoubtedly tend to lower the average speed, as it is impossible to keep the track sufficiently clear to permit of a certainty in reaching the maximum speed as a daily average. It is true that this one objection—freight traffic—has in many cases been entirely obviated by building separate tracks for freight-trains, but is evident that a road must be in pretty successful operation before it can undertake such an extensive increase of road facility.

The question of frequency of stoppages is another highly important and at the same time, delicate question. Where competing roads are endeavoring to obtain the bulk of patronage in towns along their lines, the sin of omision in regard to train accommodation is visited with swift retribution. The worthy inhabitants are quick to feel slighted if train after train passes through their town without stopping, and if another road is more generous in its accommodation it will be likely to obtain the greater, and in fact, almost the entire local patronage. To some extent this difficulty has been overcome by the introduction of the common-sense "flagging" system, by which trains are stopped at certain points only in case there are passengers to take up or deposit; and doubtless the flagging system conld be employed to a greater extent than at present with beneficial results; but at best an average time allowance must be made for signal stops, and the rate of speed lessened thereby. While express-trains, running between two important centers, and having few, if any, intermediary stops, are not directly affected by this

question, they are indirectly, for if the local traffic is great and the train accommodation ample, there are always unforseen delays occurring which must be discounted and an allowance made for their occurrence. With local trains, a very high rate of speed will never be possible, relatively speaking, for the stoppages will of necessity be numerous, and even if to obtain a greater speed more trains are run alternating in their stops at local points, while a little time may be gained, the increase of travel will increase the allowance made for unforseen detentions, and if connections with boats or other roads are to be made at these local points the allowance must be generous.

Despite all these drawbacks we are making wonderful progress in the matter of railway speed, and to-day run the fastest trains in the world. The old hallucination that England beats us in the speed of our passenger-trains is fast disappearing, and our people are beginning to realize that in this regard America is at the front. The above questions are meeting with constant study, and capable management has reduced the speed question to an exact science. Of course the limit of speed has not yet been reached, and I doubt the soundness of George Stephenson's opinion that railway trains could never much exceed a speed of sixty miles an hour; but of late the principal increase has resulted from a study of the small obstacles—the saving of a few minutes here and there, a saving small in each individual case but aggregating in a great time economy; and the increase of the capacities of passenger-train locomotives will undoubtedly continue even after systematic management has accomplished the utmost economy of time in the study of the smaller details. We have only to wait and we may yet travel at the rate of one hundred miles per hour.

In the meantime it is hardly necessary to state that one of the greatest questions if not the greatest, entering into the question of speed, is the discipline and system of a road. Without a perfect system and a rigid discipline high speed would be impossible even were every other condition perfect; and certainly in this respect our leading lines are deserving of the highest praise; for every day sees a greater attention paid to those details of travel which have greater bearing than the average traveller would think, not only upon the speed of trains, but upon the comfort, safety and reliability of railway travel.

AN INSTRUCTIVE EPISODE IN BRIDGE-BUILDING.

BY THOMAS M. GRIFFITH, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

ANY notice of bridges for teams and pedestrians, might be deemed out of place in a journal devoted to the interests of railways and such matters as at first sight seem to be directly related to them. But as a river is fed by tributaries, and they again by smaller streams, so the great volume of the business of a great railway line, must come to it through humble but many sources. Therefore common roads are a necessity of their existence, and as these common roads must in most cases cross more or less gulches, ravines, and streams, bridges are a necessity to them, and of course to the railways. In many cases it is so much to the interest of a railway located in a valley traversed by a river, to draw business to its line from the opposite side, that it has been their policy to encourage, so far as possible, the construction of such bridges. Of course it is needless to say that the adjacent county has in such cases derived a benefit quite commensurate with any advantages which the railways may have acquired in thus endeavoring to swell the amount of its freight.

Of course it is impossible for railway companies to undertake the construction of many such bridges. The most that can be expected of them, is that they may give aid and comfort to the enterprises by indirect means which may not seriously interfere with their more important functions. As the great through lines of railways now carry almost all passengers and freight, there no longer exists the necessity for long and direct common roads with their coaches and freight-wagons; consequently there are comparatively few long, or large road-bridges required for them, and the railways are developing the necessity for short roads which for the most part need to cross only the smaller streams.

Up to some twenty or thirty years ago almost all bridges which were not built of stone were built of wood, both for common roads and railways; but the growing scarcity of timber and its increasing price have wrought a great change in bridge construction until now they are almost universally built of iron and steel. Formerly it was the province of the railway engineer to design the bridge structures of his road; now his duties are mainly those of location, and advisory in purchasing material.

As a rule a railway company may supply its line with first-class iron or steel bridges with little trouble from the fact that they usually know through the advice of employed experts, what they want, and there are highly reputable, and responsible firms, upon whose material and work they can depend; but unfortunately this happy condition of affairs does not seem to exist to a large extent when the means by which the smaller common road bridges are promoted are brought into play. Here there appears to be a sort of happy-go-lucky, hit-or-miss system, or no system at all, which might, were it not that its results quite often are serious, be regarded as comical. We will suppose a case where the proposed bridge is not to be a toll-bridge built by a joint stock company composed of citizens who have investigated, as far as lay in their power, the possibility of the scheme and its probable cost, but one which is to be built by a county, through its supervisors, none of whom have any particular interest in the affair, and perhaps none of whom would be capable of giving much time or attention to it.

This suppositive case occurred in the county of Hardscrabble, the citizens of which had elected their board of supervisors with the understanding that a bridge must be built over Coon Creek in order to shorten the distance between a distant part of the county, and the Cross-Tie Railroad station. The election had been a closely contested one as various interests were to suffer by the improvement. Several saloons would without doubt lose a considerable part of the lucrative business they had so long enjoyed, and some of them saw ruin staring them in the face. This fact had for a series of years kept the enterprise back, but now there was a hope that it could be pushed forward. "Pursuant to a code" the new board of supervisors met, and after a few preliminaries the

bridge question came up, was discussed at some length, and then the meeting adjourned. At each subsequent meeting this all-important question was the chief order of business, and at one of these meetings it was decided that the bridge should be let by contract to the lowest bidder. Of course no survey or plans had been made, and in fact, owing to local jealousies, the exact location for the structure, whatever it was to be, had not been decided upon. An advertisement soon brought a swarm of seekers after contracts whose method were not formulated by ethics or mathematics, but which assumed many various forms. Some hoped to obtain the coveted prize by appealing to the supposed cupidity of the supervisors and outside men of influence, and their lumber yards, stone quarries, etc., were looked at with a promising eye, as places which might be worked in the interest of the proposed improvement. Others were more direct, thus emulating the short route from point to point which the public work was to effect, and yet another appealed to the taste for drink which the rubicund probosces of some of the moulders of public sentiment in Hardscrabble county indicated as the proper weapon with which to batter down the wall of their citadel.

Occasionally ten or more of these contract-seekers would come in conflict, and at such times the effort to outdo each other by a display of scientific skill and stories of long experience and practice in their art, would lead the uninformed listener to infer that this small improvement in an interior town and over a small creek had attracted the attention of the greatest constructive minds of the age. Their theories were as wonderfully varied as their experiences had been, and the awed supervisors and the leading men were confused with their own weakness and ignorance of what to do. Leading questions were propounded by them, generally to be met by unsatisfactory answers, and more especially as to the best site for the bridge; and the interest of the land-owner who was or was not to be benefitted by it formed a most alarming fact in their decisions, each being anxious to follow the wise advice of Roderigo to Dago: "Put money in thy purse."

The hotels and saloons were prosperous. Almost every train which arrived brought guests to them, who must spend a few dollars with them, and the arrearages of Boniface with his butcher, baker and grocer were made up, and business was looking brisk in Hardscrabble county. It became a question would it not be well to advertise further and wider, and defer the letting indefinitely in order to continue this influx of travel and money to the county of Hardscrabble, but after a time those persons who did not perceive that they were directly benefited by it, and were moreover jealous of the supposed great accumulation of wealth by those who were the first to receive benefit and supposed to be the only ones who were to derive any of the advantage of this golden tide, began to exhibit a nervous discontent, and, arraying themselves in an opposition party, denounced the whole scheme as a useless expenditure of public money, and a fraud upon the taxpayer. The improvement party then felt the necessity of urging heroic measures and the outside pressure became so powerful that the day for opening bids was set and the award was let to the lowest bidder.

Now it so happened that the span of the bridge had been determined upon, but there was no plan or map to show that the stream made a sudden turn at the foot of the street where Slim Jones, who owned the adjacent property, had succeeded by some method never fully explained, in persuading the supervisors to locate the bridge; and this fact had not been discovered until the contract between the successful adventurer and the county of Hardscrabble had been sealed, signed and delivered, and then it was pointed out by a stranger who happened by a mere accident to come to town.

Great was the consternation at the announcement of this long-existing but recently discovered fact, and greater still the unanimity of judgment on all sides that if a bridge of that given span were set on the line of the street, the first flood would be disastrous of consequences to the bridge as well as private property. The people of Hardscrabble therefore remonstrated against an absurdity which had now become so apparent to all. Another fact developed itself soon to the citizens of Hardscrabble county and its supervisors, and that was that in order to obtain any modification of the contract between the county and the bridge-man, great concessions would have to be made by the county, that is to say, the bridge man had a good hold on the county. In other words he had a good hold of the handle-end of the whip while the county did not even have any hold of the little, or lash end of the instrument of torture. Soon after this the stranger who had appeared in town after the excavation for the abutments had been made and the foundation had been started, and who had so disinterestedly given it as his opinion that the abutment of the bridge was a bad one, made his appearance again, and this time he seemed to fraternize with Slim Jones, who owned the adjacent property, and with the bridge man, who also came at the request of the supervisors who were anxious to know how they could best and easiest extricate themselves from a blunder by modifying the terms of the contract, as these three persons were seen together in a most agreeable state of mind and apparently in full accord with each other.

The bridge man upon being interviewed, issued his ultimatum which was that he would permit of no change in his contract, which he was ready to fulfill, without full damages for the amount of work that had already progressed, and a large extra for any change or addition, as he was ready to put the bridge upon the wall erected to receive it.

The writer has forgotton the exact price claimed, but the cost to the county of Hardscrabble, was some three times what the improvement should have cost. This was not the worst of it, for the almost unanimous verdict of the persons who had sought super-structure contracts was that the building of piers and abutments was a very simple and easy matter. The supervisors had been lulled into a sense of ease and security as to that part of the work as one about which they need give themselves little trouble, and as the super-structure contract had cost them a larger proportion of the sum of money which had been appropriated than they had expected it would, they all saw the necessity of reducing the cost of the masonry to a minimum. Therefore this part of the work was let to a local mason whose business had previously been confined to the building of stone walls in the village and in the surrounding country. Now unfortunately for the county and this stone mason, who was really more anxious to do a good job than his experience justified himself or any one else

in hoping that he could do for the price at which he had agreed to do it, there occurred a freshet of unprecedented dimensions soon after his work was up and the bridge man had rested his frail super-structure upon it, and the stream having been narrowed very much by the pier and abutments, which, notwithstanding the improved direction which had been given to them after the advice of the disinterested stranger, were insufficient for the easy passage of the water, and a large part of it found a convenient channel over the road approaches to the bridge, and through gardens and back-door yards, tearing out the crops, and disturbing setting hens and in several instances floating away with their privacies, and before the rush of water was through with, one of the abutments toppled over and the new iron bridge fell with a crash, and was a mass of bent iron beams, and rods, which appealed to the sympathy of the junk-dealer. And now the county was minus a bridge even at its great cost, and had an awkward obstruction to remove, besides several ugly claims for damages to private property, the largest of which came from Slim Jones, the most active person in promoting the scheme, and locating the work.

This catastrophe fell like a thunder-clap upon the poor county of Hardscrabble, and it was several years before it could recover from the shock. But the people of the county during that dark period gathered themselves together, especially during the long winter evenings, in the stores and bar-rooms, and discussed the catastrophe and the various mishaps, errors and steps which had led to it. They canvassed the capacity, and the character of the supervisors, and of the moving spirits which had influenced their action, and more especially that of Slim Jones, who began to be looked upon by all with suspicion and distrust, and by the most outspoken, was boldly denounced as a fraud, a cheat and a rascal.

It was also ascertained that the bridge man was a shrewd teamster, who had been employed by one of the contractors who had graded a section of the Cross-Tie Railroad, and who had been attracted thither by the advertisement and the hope of a better position in life, and that after obtaining the award, had purchased a bridge of the Jack-of-Clubs Iron Bridge Company, which has the worst reputation of any pot-metal concern in the country; and that the disinterested stranger, was, to use a term much used in Hardscrabble county, "in cahoots with him," and also with Mr. Slim Jones. The latter person it was suspected had furnished most if not all of the money with which to set the bridge man upon his legs.

The most enlightened among the inhabitants of the county finally assembled together to discuss the direct and indirect losses to the county in money and business. The simple methods of arithmetic were quite adequate for the first, but for the last the skill of a political economist was required. The chief products of Hardscrabble county were flag stones, hoop-poles and tan-bark, and without the bridge it was impossible to reach the most available station of the Cross-Tie Railroad with these heavy products except at the lowest stages of water, when Coon Creek could be forded; and consequently large piles of these commodities had accumulated on the bank of the stream awaiting favorable times for re-loading and crossing the ford with them to reach the station; and sometimes the commodities were delivered at the station at a time when there was a rush of other business so that they could not be shipped at the most advantageous rates. This brought the inhabitants of Hardscrabble county generally into bitter hostility with the Cross-Tie Railroad Company, but in the end it had the effect of directing the attention of the officers of the road to the trouble, with a view of assisting the county of Hardscrabble, and making itself sustaining and less dependent upon the heavy assessment placed upon it for the poor privilege of crossing it and reaching the more productive regions beyond. They therefore instructed one of its most prudent engineers to domicile himself at the leading hotel in the village and educate the most intelligent and influential of its residents when opportunity occurred as to the proper thing to be done. In due course of time an arrangement was made between the county of Hardscrabble, and the Cross-Tie Railroad Company, by which a part of the taxes of the latter were to be remitted for a period of years, in consideration of the construction and maintenance of the bridge by the county, the Cross-Tie Railroad Company to furnish free transportation for all of the material required in its construction, and to contribute one-third of the amount the bridge would cost, and by this time the greater enlightenment of the supervisors had suggested that a competent engineer should be employed to make a thorough survey of Coon Creek and furnish plans for a bridge.

Mr. Tripod Boots was duly elected by the supervisors, by the advice of the president of the Cross-Tie Railroad Company, and his appearance in town created quite a sensation. His first business was to inquire of the oldest settlers in regard to the highest water which they had seen, and to seek for water-marks by which to coroborate their statements. Then there were a few days spent in surveying and mapping Coon Creek for some distance above and below the bridge site. Some days after this he exhibited a plan for construction and location of the piers and abutments which were set so far apart as to admit the largest volumes of water which were ever likely to occur to pass freely between them.

In due time a good and substantial bridge was erected upon this masonry by the Tubal Cain Iron and Steel Bridge Company, and the county of Hardscrabble is now and has been for some years deserving of a better name than it has enjoyed. Other industries have developed, everybody has something to do, taxes are lighter and those of the Cross-Tie Railroad are less than half of what they were when the road was first opened and when it was the least able to pay them.

The county supervisors were so well pleased with the bridge and themselves that upon its completion they voted a considerable sum out of the treasury to have a cast-iron tablet made, including all of their own names in full, and that of the engineer, Mr. Tripod Boots, upon it in bas-relief letters, and they had it rivited fast to the iron frame of the bridge.

This suppositive case is not so very suppositive as the reader might suppose; but is a tolerably fair sample of what has been and is now being the parallel and hard experience of many a much-needed public utility in some of the highways and by-ways—even in regions not very remote from the supposed centres of civilization—and in the hope of shedding a little light on the methods now in vogue of constructing public improvements, I have given it without comment to the readers of the JOURNAL.

THE PRODUCTION AND CONSUMPTION OF RAILS.

THE iron trade is aptly termed the barometer of the general prosperity of the country, and during the past year business men of all classes have been eager for any news pointing to a revival of this important industry. It may be stated with as much show of justice that one of the best indicators of the condition of the iron trade itself is the status of the steel-rail industry. Such a statement may be justified by pointing out that the railroads, the best customers of the iron and steel-mills, are forced before anything else to anticipate their requirements of rails, which cannot be classed as a staple article, and must, therefore, be ordered months in advance. It is undoubtedly true, on the other hand, that our Bessemer steel industry is suffering from evils which do not to that extent affect other branches of the iron trade. The latter are not so abjectly dependent upon the railroads. They have many other consumers to fall back upon, some of whom may and do flourish at times when existing railroads are poor and new enterprises are not thought of. Still the fact remains that every single department of iron-making keenly feels the want of orders from that quarter, the influence of the fluctuations of which may, however, be best traced in dealing with rails.

The demand for rails comes from two sources—for new construction and for renewals. A very fair approximation to the former may be estimated from the careful compilations of new mileage added annually to the network of railoads in the country. There are, however, some difficulties to contend with which render accurate statements of consumption for this purpose impossible. The quantity of rails required per mile of track varies within very wide limits. It is only 61.5 short tons for narrow gage and as high as 99 tons for standard roads. Besides this, the weight of the rails used is much greater to-day than it was ten years ago. It may be assumed that in 1867 the average was 90 tons per mile, gradually increasing until it is now 95 tons per mile. Another point to be considered is the mileage of the second track, sidings, etc. It, too, has steadily increased. From present statistics it would appear that the accessory tracks add as much as 23 per cent. to the length of the road in the United States, and therefore at least 20 per cent. may be added to the number of miles of new road built every year to get at the actual mileage of track laid. Thus a series of figures are obtained on the basis of the number of miles of railroad constructed annually, from which a fair estimate of the quantity of rails used for this purpose may be deduced. On the other hand, we know from the statistics of production of iron and steel rails, carefully collected annually by the Iron and Steel Association, and from the imports of rails, how large the apparent consumption was every year. This, of course, neglects the stocks in makers', consumers' and importers' hands, which, however, in the case of rails are a less important matter than in the majority of other commodities. The difference between this apparent total consumption and the quantities used for new mileage would fairly represent the consumption for renewals. The following table has been computed in the manner indicatad:

	Increase of Mileage.	Total Consumption.	New Roads.	Renewals.
1867	2,449	627,157	279,200	347,957
1868	2,979	756,795	339,600	417,195
1869	4,615	906,749	504,000	402,749
1870	6,070	1,019,153	663,000	356,153
1871	7,379	1,341,434	814,800	526,634
1872	5,878	1,530,850	648,900	881,950
1873	4,107	1,148,849	453,400	695,449
1874	2,105	837,724	234,900	602,824
1875	1,712	810,770	191,000	619,770
1876	2,712	879,916	302,600	577,316
1877	2,281	764,744	257,300	507,444
1878	3,687	882,695	303,000	579,695
1879	4,721	1,157,420	532,500	624,920
1880	7,174	1,752,526	817,800	934,726
1881	9,789	2,230,421	1,116,000	1,114,421
1882	11,591	1,912,921	1,321,000	591,921
1883	6,755	1,399,671	770,100	629,571
1884	3,800	1,120,000	434,200	685,800

It will be noted that in a general way the quantities for renewals fluctuate far less violently than do the amounts used for the construction of new roads. The figures for the latter lap over, of course, from year to year—that is to say, a considerable proportion of the rails produced in one year are in reality for consumption in the next, and the variations from year to year, therefore, appear more violent than they probably are. This partly explains such apparent anomalies as are exhibited by the fact that, although the mileage of new roads built in 1882 was much larger than it was in 1881, the consumption of rails shows a heavy decline. Of course, being deducted from the tonnage for new road-bed, the requirements for renewals are in a similar manner less subject to sudden variations than indicated in the table. With such variations growing out of the necessary intervals of time between the manufacture and the laying down in the tracks, the table given illustrates some important general truths. It shows that our rail-mills can depend upon a certain quantity of work annually, say, at least, 600,000 tons for renewals. It is well known, and this fact is brought out clearly in our estimates, that the requirements for this purpose may be withheld for years, and then may come with a rush which stimulates booms. This accumulated demand, it may be noted, is the first to make its appearance. This is only natural. One or two years of prosperity to the railroads induces its officers to make repairs long deferred; then, flush times continuing, comes the craze for feeders and branch lines, followed by the wild scramble into new enterprises by the general public. The period of 1880 to 1882 witnessed a movement of this kind, which was probably exaggerated by quite a widespread replacement of old, worn-out iron track by steel. The drop in the quantity to the normal needs, or probably less than normal needs, in 1882, shows how that movement had spent its force while the other was still working toward its climax.

It would be idle to deny that the wants of the railroads for the replacement of worn-out rails are likely to fall off rather than increase, in spite of the greater mileage in use. All our roads of any importance are now equipped with steel rails, which, even under a heavier traffic, heavier cars and heavier engines, are likely to last longer than the old iron rail under a lighter duty. Unfortunately, we do not possess any very reliable statistics concerning the percentage of track still laid with iron, and even if we did, the bare figures would not permit of any valuable deductions without data to judge of the traffic which roads so equipped are called upon to bear.

Taking everything into consideration, it may be asserted, on the basis of the estimates submitted, that between 600,000 and 700,000 tons of rails will be called for annually for renewals, while the amounts wanted for new roads will vary in direct proportion to the mileage under construction. If we continue to build at the rate of 4,000 miles per annum, which is not probable under existing circumstances, the orders from this source will be less important than those for the purpose already referred to. This means a prevalence of inquiries for small lots of rails, which have been, and promise to remain, a leading feature of the markets. The outlook, statistically, is certainly not one of great encouragement to our rail-mills. With full possession of the field, unhampered by foreign rivals, their capacity is in excess of any early prospective demand, and, other things being equal, works of smaller capacity, which can be kept running regularly, appear to have the advantage over their larger competitors.—*Iron Age*.

THE ENGAGEMENT AND MANAGEMENT OF RAILWAY EMPLOYES.

GOOD men, who have become acquainted with their duties and who perform them with faithfulness, are the most important of all the appointments of a railroad. It is a long process to educate a fresh man to a new place or to a new business; all the experience which the old hand has acquired is of value to his employer so long as he continues to do well or to intend to do well, although too long continuance in one round of duties is apt to make a good man dull, and it is therefore advisable to make some change occasionally for all employés, promoting them if an opportunity presents, which will encourage not only them, but their associates, who then see that patient merit attains reward, even though slowly. Frequently, with a little trouble, a vacancy may be availed of to move several persons up one round of the ladder each, and conscientious managers find much pleasure in the larger number who can thus be made happy, at the same time that the service is benefited and strengthened. It is easier for indifferent managers to fill a place with the fewest number of changes.

The great advantage to the company of experienced men makes it a difficult matter, sometimes, to decide upon the most judicious course when a disaster caused by the neglect or oversight of an employé calls for a judgment upon him. The *disciplinarian* would dismiss him from principle, believing that he had thereby taught a lesson to the remainder of the force; but it is doubtful whether the fear of dismissal has any effect upon the larger number of employés. Let the manager consider how it is with himself or with the other officers of the road; do they perform their duties because of fear, or because they have undertaken them and feel a manly pride in seeing them well done? There are sneaks, of course, among railroad employés as among officers, yet they are rare; the great majority are meaning to do their duty as they understand it.

The case of an erring employé should be tried upon its merits, with regard to the previous record of the employé, considered with reference to the interests of the company, and generally without regard to the other employés. Has this always been a careful, dutiful man? Did his fault arise from ignorance, forgetfuluess, indifference or laziness? If from ignorance or misjudgment, did he use the best wits he had and do as well as he knew how? If so, he does not deserve great condemnation, even though he may have caused great damage. If from forgetfulness, not habitual, but instantaneous, as has often happened to switchmen and conductors, dismissal is no remedy; the remedy has been applied by the accident; he will be a safer man ever after. If the fault was from indifference or laziness, it is sure proof of a worthless character—that is, worthless for railroad purposes. Good conductors and excellent enginemen have forgotten for a dangerous interval their telegraph orders, and caused disasters; when pardoned because of their long and perfect records, they proved safe men and the most devoted servants of the company for years after. It was not found that this leniency had a bad effect upon discipline as related to the other employés; on the contrary, these perceived the value which a good record might have for a man who fell into trouble.

All men must have some education in railway operations before they will become experts, and in requiring this they will make some mistakes likely to cause accidents and trouble; it would be a grave error on the part of the manager to discharge men who have had this education at his expense, to take on fresh men to be educated in the same way. We can imagine something of the state of a road upon which all the men should be new to railway business, or, even if experienced men, new to the road. By the frequent discharge of employés, for trivial mistakes, some roads maintain a permanent approximation to this condition: their accidents are not thereby diminished in number.

The standard of character among employés may always be raised by slow degrees, but surely, if proper care is exercised in the hiring of new men. Generally something can be learned about the character of every applicant; a wandering man without a certificate from his last place is not a desirable acquisition, and even a certificate requires to be scanned closely. If a man is employed upon a certificate from another road it is a safe precaution to write to the officers of that road for private assurances; for, in the first place, many officers give unwarranted certificates, which they will not support in private correspondence; in the second place, there are men who make a business of furnishing certificates of character and recommendations for passes to any one who will pay for them, frequently stealing the genuine letter-heads and forging the office dating-stamp. The sons of industrious farmers in the vicinity of the road are usually glad to get employment, and are a healthy stock to recruit from, if judiciously selected.

Brakemen and firemen are two classes of men who require to be chosen with peculiar care, as it is from them that the conductors and enginemen are to be developed; and since they are really apprentices, with the largest pay that any apprentices receive in any trade, it is not worth while to throw away the valuable instruction they are to receive upon inferior characters. Upon brakemen a great responsibility is necessarily placed from the first. A reliance upon them for faithful performance of their duties without good evidence of their responsibility would invite disaster. Firemen should be of a mechanical turn of mind, and ambitious to become enginemen; there are

plenty of young men with these qualifications, and it is a waste to employ any others; they make the better firemen, of course, from their hope of advancement.

In filling vacancies, the best general policy is to promote deserving employès whenever there are such who are competent for the positions, and to fill up the ranks of apprentices in shops, stations and offices, as well as other minor appointments, from the families of old employès, so far as possible. The children of employès are in a sort of apprenticeship from their birth; they have opportunities for learning many details which others can only acquire after a considerable period of service; they are already attached to the road and its managers, if the management has been just, and this attachment may be of great value to the company; it is an inducement to continuous and faithful service if the employès understand that these chances for a start in life are reserved for their children.

It does not admit of doubt that good service may be more promoted by rewards than by punishments; yet fines imposed for carelessness are a legitimate and effectual penalty, if due care is taken not to impose them unjustly, and the men will recognize the fairness of paying them, if within their means. when by carelessness they have caused damage. Rewards, however, are more stimulating; premiums for savings on engines, for superiority in maintenance of track, and promotions of the most deserving, without favortism, encourage a generous strife for excellence. Heroic actions, or one of uncommon merit, should be acknowledged by a letter to the deserving employè, and it is all the better if accompanied by a small present in money. Such tokens of approval have been dear to men always; the railway employè like to show them, as a soldier does his medals.

Discipline is only maintained by careful attention to small details. The experience of armies shows that men do not fail in the important things until they have become negligent as to the less considerable. A superintendent, supervisor or foreman must therefore be continually looking for the small defects if he hopes to avoid the larger; nothing which is not exactly right should pass without remark; nor, if not immediately corrected, without a louder remark. It is probably not necessary to say that if the superior officer keeps his temper, under whatever provocation, his determiuation to require perfect obedience will be more manifest and more felt than if he falls into a passion; at the same time he will be more comfortable himself.

The condition of enginemen and firemen, of conductors and brakemen, is apt to be forlorn when they are away from home; some provision should be made for them to sleep and eat in comfort; and a sitting room where they can pass the dreary hours of waiting, amused with games or the newspaper, is necessary, if it is not preferred that they shall haunt the taverns. These arrangements can be made self-supporting, but the company must take the initiative and furnish a suitable building, which may be let to a landlord who will keep it upon terms dictated by the company, if that is thought best.

Employès associations for any purposes, as for clubrooms, hospitals, insurance, lack the most important condition of success, which is a promise of permanence. Any employè, or a considerable number of them, may leave the road at any time, and the society may fail suddenly from want of support, or the employè may cease to benefit by his contribution because of his own removal; it is, therefore, important that the railway company should be a subscriber to, or guarantor of, such associations as it would wish tō encourage. So far as experience goes, it appears that the men are less interested in libraries and reading-rooms than in reasonable bodily comfort while living, and in benefits to their families in case of death or injury, and a judicious manager can secure the hearty co-operation of the employès in any well-conceived undertaking which has these ends in view.—*Railroad Gazette.*

A SUBSTITUTE FOR POOLS.

RAILWAY managers would very much like to discover a substitute for pools, some plan that would possess superior advantages and yet be free from the acknowledged defects of the present system. But heretofore the only feasible method of dividing the traffic and thereby maintaining rates has been by means of pools.

Of late, in view of the pool entanglements and troubles, the suggestion has been made that the English system of a clearing-house for freight and passenger revenues be adopted. This plan is on the basis of dividing the traffic itself.

At the outset let it be stated that either system is open to the same legal objection of being a contract in restraint of trade and therefore unfavorably regarded by the courts. We apprehend, however, that, if it could be sufficiently shown that pooling or clearing agreements were necessisities and essential for the safety of competing railway lines, the courts of last resort would reverse their innuendoes and *obiter dicta* as tò their illegality. Judge Cooley, who is a splendid authority, inclines to the view that, if tried by the test of ancient precedent and decision, these pooling contracts would be rejected; still we believe that if the case were to be well argued there would be a disinclination to weigh the living facts of the present in the decayed and musty scales of the past.

Tonnage pools have serious disadvantages from which the clearing-house system would probably be free. It may here be said that this latter plan is much like that used by banks, which send the checks received by them during the day to a place of exchange, the authorities of which adjust the amounts and, giving to each the drafts that are drawn on it, pay or receive the balances. Now, if three, or four, or ten railways were members of a clearing-house, similar in general characteristics to that formed by banks, each would send in every day the way-bills issued by it and this central authority would check up the charges called for by these way-bills and at stated times divides it in agreed proportion, and the railways reporting more than their proper share would pay the excess to the clearing-house, which money would be paid over to the roads carrying less than their share.

It will be seen that such a scheme makes no allowance for freight charges not collected, nor for rebates or reductions given to shippers. In this last respect is one of the principal advantages of the new system, for what road would be willing to make deductions for which it should receive no credit? If the motive for a deed be taken away it will not be done. So with this cutting of rates, which pools have not heretofore been able to

end, if no advantage is to be gained by making concessions the tariff is likely to be strictly maintained.

Pools in many instances are nothing more or less than bribes to small roads to maintain rates. If the clearing system were to be adopted a better check could be had upon these unruly beneficiaries.

The difficulty after all arises from the lack of intelligent coöperation among railways. Instead of perfect confidence there is often, and justly too, mutual distrust and suspicion. The history of pools is a record of agreements ruthlessly violated, of contracts disregarded, of subterfuges and of an underhand writhing out of burdens willingly assumed. This may be a severe arraignment, but all who know anything at all of the operations of railways are aware of its truth. There was often some excuse for actions that were open to condemnation, but there is no longer any reason why a reform should not be inaugurated.

If pooling agreements or clearing contracts could be honorably observed, doubtless either would answer the purpose sufficiently well; but always there is some road that believes it can do better as a free-lance and so virtually becomes a railway Ishmaelite—its hand is against every one and the hand of every one is against it. With a difficulty such as this it is hard to deal. Even the leading and influential lines, which, if thoroughly united and resolved upon any one course, could enforce it, are wary and noncommittal. What can be done under such circumstances?

It is foolish to expect that as long as this state of affairs exists a mere substitution of a clearing system for pools would be of any material advantage. Such a change would be a novelty—nothing more. We must go deeper and see that the foundations are substantially prepared and then an edifice can be erected that will be durable.

We incline to view that a wise clearing system would be an improvement upon pools, for by it a more thorough discipline can be enforced and the operations of the road kept under more effectual supervision. It is necessary to have this centralization, for railways must, like individuals, who surrender part of their natural prerogatives to a central government in order to make the remainder more secure, be willing to give up some of their independence so that they may realize greater returns to their owners.

Before the clearing system could be put in operation there must be a most genuine and thorough conversion on the part of all who heretofore have acted in a way that in private life would be looked upon as dishonorable, for all must be willing to be honest and faithful to promises. After such an experience as those now in charge of our railways have had they will naturally be reluctant to believe in this conversion. Men who have been inflexibly honest and honorable in their private life have felt that in managing railways they must fight the devil with fire—in other words must meet subterfuge with prevarication and fraud with concealment.

The person who supposes that all this is to be changed in a day, or by merely wiping out the record of the past and beginning over again, is indeed simple and upsophisticated. The work of regeneration will be a long and weary process, and the delays and discouragements will be numerous. Yet, no one can either say that the task is impossible, or that it ought not to be forthwith undertaken. When railway officials of advanced ideas and earnest purpose shall undertake to bring about a combination for the purpose of operating railways on the basis of absolute integrity and honor, it will be easy to take up any of the various plans for coöperation that may be fixed upon, and carry it out to a successful issue.

In the discussion of all theories the present condition of affairs and the individual circumstances that surround railway officers must never be overlooked.—*Railway Register*.

Heavier Rails Needed.

SINCE steel rails were introduced the railway companies have continued increasing the size and weight of their rolling-stock, and the speed of trains has also been materially accelerated, till the rails which carried trains safely ten years ago are not, according to the *American Machinist*, sufficient to endure without danger the blows from the cars or locomotives now in use at the speed the blow is struck. Although trains in Great Britain maintain a higher average speed than those run on American roads, accidents from broken rails are almost unknown there, the cause of this exemption from breakage being due to the great weight of rail employed. While our leading railways are using rails weighing from 50 to 60 pounds to the yard, British roads doing similar work have rails weighing from 65 to 85 pounds to a yard. American engineers assumed that steel rails could not be overloaded by ordinary railway locomotives or cars, and they introduced rails that were too light in the first place, and the breakages due to inherent weakness are now manifesting the mistakes made. There are thousands of miles of railway track laid with steel under 60 pounds' weight to the yard. Every train that rolls over this track takes part of the steel away, so that the rails are getting smaller and weaker every year. As this weakness grows, the increase of accidents from breakage will go on. The interests of safety already demand that the steel rails on many roads should be renewed with heavier patterns, or that the weight of locomotive drivers and cars should be reduced.

Military Utility of the Railways of India.

MR. EDWARD KIMBER, says the London (Eng.) *Railway News*, in his address on the 20th of March, to the Popular Scientific Society at the Royal Aquarium, Westminster, pointed out that the different Indian princes see in the yearly increase of railways a facility of concentrating troops of which they and their ancestors have never dreamt. The East India Railway, of 1,500 miles, dominates the northeast of India as far as Simla, in the north, and Jubbulpore in the south, while from Simla, round to the Afghan frontier, down to Kurrachee, on the west, the Indus Valley Railway, of 509 miles, completes the northern defence of the country, and enables 100,000 troops to be thrown upon any point of 2,000 miles run within a few days. The Bombay Baroda and Central Indian Railway, of 438 miles, protects the wealthiest and most valuable part of the west coast; while the great Indian Peninsula Railway of 1,288 miles, strikes upwards through the country to Indore, Khandwa, Nagpur, and Jubblepore. The Madras and South Indian Railways, of 1,514 miles,

stretch across from the east coast towards the west, through Bellary, and join the Bombay system. Their ramifications to Bangalore, Beypore, Trichinopoly, and Tuticorin make them practically the commanders of the whole south. The Scinde Punjaub and Delhi Railway, of 663 miles, the Rajputana, of 1,116, and the Northern Bengal, of 280, belong to a system of scientific railway strategy, the value of which would be demonstrated immediately were there another mutiny or an active Russian aggression on the Afghan frontier. These railways not only enable the British garrisons to keep the semi-barbarous native states in order, but should these states be able and willing to furnish contingents, as many of them are, to resist the Russians, these forces can be pushed on to the frontier with the greatest ease and dispatch. The great strategic lines are for the most part completed, but there yet remains a great deal to be done in the direction of lines which would not only pay a good dividend from local traffic, but which would in case of need be useful for the transit of troops. The science of railway strategy has been brought to a perfection in India it has not attained in any other country.

Railways Superseding Canals.

SOME ten years ago Mr. Edward Crane defied the Massachusetts Legislature and the railway men of the State of Massachusetts with a declaration that railway transportation would yet be made cheaper than water transportation, and that railway competition would drive out lake and canal transportation. In the last quarterly report of the Treasury Review of Statistics (page 418) it is shown that the tonnage transported on the New York State canals has fallen from 6,442,225 tons in 1868 to 5009,488 tons in 1884, while the tonnage on the New York Central and Hudson River Railroad has increased in the same time from 1,846,599 tons to 10,211,418 tons; on the Erie road, from 3,900,000 to 11,071,000, and on the Pennsylvania, from 4,722,000 to 22,583,000. This is exclusive of the tonnage moved on the leased lines. The tonnage transported by rail on the four American trunk lines increased from 44,767,954 tons in 1880 to 53,549,316 tons in 1884.

Master Car-Builders' Association.

THE nineteenth annual convention of the Master Car-Builders' Association will be held in the Hygeia Hotel, at Old Point Comfort, Va., beginning on Tuesday, June 9th, at 10 A. M. The following is a list of the subjects on which it is expected that special reports will be made, and which will be discussed during the sessions of the Convention:

1. A Standard Form for the Treads and Flanges of Wheels.
2. Standard Freight-Car Trucks.
3. Brake-Shoes, Brake-Beams, and Interchangeable Parts of the Brake Arrangements of Cars.
4. Standard House-Car to Carry 60,000 pounds of Lading.
5. Standards and Appliances for the Safety of Trainmen.
6. Passenger-Car Framing and Trussing.
7. Automatic Freight-Car Brakes.
8. Freight-Car Roofs.
9. Trap-Doors in the Roofs of Passenger-Cars.
10. Side-Dumping and Drop-Bottom Coal-Cars.
11. Standard Dead Blocks.
12. The comparative advantages of the two methods of constructing freight-cars, with and without Platform Timbers or End-Sills projecting from the end of the car.

A meeting for the revision of the "Rules Governing the Condition of and Repairs to Freight-Cars for the Interchange of Traffic," will be held on the first day of the convention, Tuesday, June 9th, at 3 P. M.

A special meeting has also been called by the Executive Committee of the Association for the consideration of "the automatic coupler question." This meeting will be held on Wednesday, June 10th, at 3 P. M., and all railway mangers, general superintendents and railway commissioners have been invited to attend to take part in that meeting, or to send a suitable person to represent them.

Privileges of French Railway Employes.

THE employés of French railways have certain peculiar advantages according to the following paragraph taken from an exchange, but it should be remembered, on the other hand, that their pay is far smaller than that of American railway men:

Employés of French railways have exceptional privileges over English, German or American railway men, such as reduced rates of freight when consigned to them, and an unusual number of personal passes. The company will also supply them with provisions and wines of all sorts at the lowest wholesale rates, and if stationed at points where such articles are exceptionally dear, where the company cannot conveniently keep storehouses, they receive certain additions to their wages, expressly designated as an indemnity to meet such cases. They are allowed to purchase their fuel at the same rate as that paid by the company, while in the case of sickness they are attended by the company's physicians and supplied with medicines gratuitously. Besides, the French companies allow what are called "primes" to all engineers and firemen for economy in machinery and fuel. The orphans of all employés killed while on duty are placed in orphan asylums at the expense of the company and are kept there until they are seventeen years old.

Railway Sanitation in New Jersey.

THE State Board Health of New Jersey has sent out circulars, of which the following is a copy:

To the Officers of Railroad and Transportation Companies of the State of New Jersey—Gentlemen: The State Board of Health of New Jersey has the honor to address you in the interest of public health in this State. Not only because of anxiety as to the possible introduction and spread of cholera, but of the intimate and constant relation between public conveyances and the spread of disease, we earnestly advise an expert sanitary inspection of all the property belonging to your respective companies.

We are aware that some of the very best methods of

structural arrangement and management are illustrated in some of the cars and stations of the various lines of railway. We are also aware of defects and neglects that are a menace to the health of the traveling public, and to the localities in which the buildings of your respective companies are located.

The attention to rooms, cesspools, closets, water supply, etc., too often devolves upon those not capable of skilled oversight, and not acquainted with thorough modes of construction, cleansing and disinfection. In times of epidemic these public places are especially hazardous. At all times they are subject to such general and frequent use as to make it needful to have a very watchful care and some system of inspection.

At a meeting of this Board, held at Trenton, this circular was directed to be transmitted to the officers of all companies doing business in this State.

By order of the Board.

E. M. HUNT, Secretary.

Dr. Hunt has heard from the representatives of the different companies. All appreciate the action of the Board, and intimate their willingness to do whatever is practicable in the way of such improvement as is suggested. President Roberts, of the Pennsylvania Railroad Company, wrote that he would call the attention of the officers in charge of the properties to renewed vigilance in the matters to which the Board refers, and he would be glad, whenever the officers of the Board in any way discover any defects, if they should promptly point them out.

Railway Wages in Missouri.

THE report of the Commissioner of Labor Statistics for Missouri shows that there are 19,486 railway employés in that State, whose yearly earnings average as follows: General officers, $4,524; assistant and division superintendents, $2,400; civil engineers, $1,844; master mechanics, $3,000; masters of transportation, road-masters and bridge foremen, $1,440; clerks, $732; machinists, $810; passenger conductors, $,1,056; freight conductors, $1,080; passenger engineers, $1,080; firemen, $660; wipers, $432; baggagemen, $600; brakemen, $684; station agents, not telegraph operators, $684; station agents, also telegraph operators, $684; telegraph operators, not station agents, $650; carpenters, $780; section foremen, $507; section men, $507; laborers, $343; switchmen and watchmen, $480; bridge tenders and pumpers, $420, and other employés, $592.

Common Sense Ventilation.

"AIR is like a rope," remarked a mining engineer; "you can pull it better than you can push it. All mechanical appliances for pushing air into a room or house are disappointing. What we need to do is to pull out the vitiated air already in the room; the fresh supply will take care of itself if means for its admission are provided. It has been usual to withdraw the air through openings near the ceiling—that is, to carry off the warmer and therefore lighter portions, leaving the colder strata at the bottom of the room, with their gradual accumulation of cooled carbonic acid undisturbed. Much the better plan would be to draw this lower air out from a point near the floor, allowing the upper and warmer portions to descend and take its place. An open fire with a large chimney throat, is the best ventilator for any room; the one-half or two-thirds of the heat carried up the chimney is the price paid for immunity from disease; and large though this seems, from its daily draft on the wood-pile or coal-bin, it is trifling when compared with doctors' bills, and with the loss of strength and efficiency that invariably result from living in unventilated apartments."

Durability of Steel Rails.

THE durability of steel rails is discussed by Mr. Webb, of the London and Northwestern Railway, who states that, according to his calculations, 1,400 pounds of steel disappear every hour from the track of that company's lines, 1,780 miles in length. At first glance this seems a surprising statement, but it is only $\frac{7}{10}$ ton each hour, or 16.8 tons a day, or 6,132 net tons each year, for a line of 1,780 miles, having an exceptionally heavy traffic. In length the railways of this country are 71.3 times that of the London and Northwestern, and at the same rate of destruction by wear the quantity of steel rails required for replacement on all the roads of this country would be only about 438,000 net tons. The consumption of rails in 1883 in this country was about 1,400,000 tons, of which 6,500 miles of new road required perhaps 650,000 tons, leaving 750,000 tons for replacements of both iron and steel. It may be inferred that the destruction of rails by wear on the London and Northwestern is not relatively so great as it may be on many roads in this country.

Electric Lights for Cars in Germany.

SOME trains on the Frankfort-Fulda-Ulm Line are now fitted up with a dynamo placed in the baggage-car on one side and accumulators on the other side. The dynamo, if driven at 750 revolutions, gives a current of twelve ampères, which by an automatic switch is sent into the accumulators. The dynamo is driven from one of the axles of the van, in a similar manner to the plan adopted on the London, Brighton & South Coast trains. The cost of installing the plant is given at $600 for dynamo, driving-gear, and accumulators, and at $16 to $20 per passenger-coach. The light itself is estimated to cost 1.7 cents per lamp per hour.

A FEW weeks since the Russian Minister of War signed a contract for the immediate delivery of steel rails to the value of £149,000, for the Transcaspian Railway. They are intended for the section of the line from Kizil Arvat to Askabad, and will be laid down in a few months. It is this railway that the Russians propose ultimately extending to India.

STATEMENTS that the Baldwin Locomotive Works contemplate moving to some point outside of Philadelphia, are contradicted by the firm. An elegant and substantial building has been erected at Broad and Hamilton streets as an addition to the works.

THE steel works of the Edgar Thompson Company, at Braddocks, Pa., have announced resumption in all departments, giving employment to over 3,000 men who have been idle since early in December.

American Railroad Journal.

A MONTHLY MAGAZINE AND REVIEW.

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Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

EDITORIALS.

MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

NEW INVENTIONS.

THE ST. LOUIS TIME CONVENTION.

THE report of the recent General Time Convention, held at St. Louis, on April 5th, affords interesting reading, not only to railway men, but to the general public. After inspecting the pages of this report, and noting the countless subjects and minutiæ of detail comprehended by the discussions, one is forcibly struck by the wonderful advances railway management has made, and by the rapid strides it is taking to reach the dignity of a science. The title of the convention is somewhat of a misnomer, for while "time" plays a leading part in its discussions, in reality the tendency of the convention was to establish fixed rules and formulas for the guidance of railway managers and employés, and to adopt a general system for the whole country.

A glance at the captions of the topics discussed will show the scope of action of the convention, and illustrate the systematic efforts of railway officials to conduct their roads on uniform principles, founded on common-sense, and possessing the exactitude of a science. Commencing with "Standard Time," the convention proceeds to the discussion of "Classification of Trains," "Freight-Train Regulations," "Conductors and Brakemen," "Engineers and Firemen," "Section Foremen," "Yard Men," "Train Orders," and under each topic a number of questions are put forth, with answers tabulated according to the number of miles of road under the control of the officials replying to the queries. While it is true that all or nearly all of the questions have a direct or remote bearing upon the time question, the general nature of the questions indicates that the gentlemen attending the convention were desirous of collating a fund of general information relative to American railway management, with a probable view to uniformity; and the wide variation of methods now practiced as shown by the answers received tends to prove that little uniformity exists at present. In the case of important queries, where the answer is a simple negative or affirmative, there is a surprising equality in the number of answers of each description; while where the questions are asked to obtain a direct statement as to methods and rules employed, there is an equally surprising diversity of replies. A state of affairs is thus shown that urges the adoption of a general system, and suggests the idea that up to the present time railway management has had much of the experimental about it.

While every road possesses a certain individuality that would necessitate special rules, this specialty invariably appertains to the smaller details of management, and in matters of weighty importance there is no reason why a uniform system should not be obtained. The combined wisdom of the railway managers should be followed by the evolution of such a system, and our railway business should resemble the government of the country, in so

much that every railway should make laws unto itself in matters applying purely to itself, while acknowledging general laws applicable to railway management in the abstract. The combination of such a system of general government with the peculiarity of a species of "State Sovereignty" would be a great accomplishment which we yet hope to see achieved. The forty-six representatives of the twenty-six railway lines, present at the convention in question, have started a movement in the right direction, and their further labors, augmented, we hope, by an increased attendance at future conventions, will be awaited with interest.

The committee appointed to examine and tabulate the replies to the various questions propounded, have concluded their labors by recommending a number of rules for general adoption under each general department of management, and the utility of the convention can be determined by watching the roads to ascertain if these recommendations will be followed. Probably it is not feasible for all of these general rules suggested by the committee to be put into immediate operation, but as far as practicable the system they recommend should be afforded a fair trial, and an incentive thus given to the furtherance of the cause of railway science. It is, moreover, safe to say that if all the roads represented at the convention follow the recommendations of the committee, the general adoption of the classified rules and regulations will be but a question of a very short time, for these roads are the representative lines of the country.

We regret that we did not receive the report of the committee in time for us to publish extracts in this issue of the JOURNAL, but in subsequent numbers we shall enter thoroughly into the subject, and publish the recommendations of the committee in full.

RAILWAYS AS CARRIERS OF CONTAGION.

OPINION differs, both lay and professional, as to the probability of a cholera epidemic in America this year, but there is a sufficient precedent to warrant the belief that we shall not escape without a touch of it, even if it is stamped out before it reaches the proportions of an epidemic. Certain it is, that if the dreadful disease reaches these shores, it will be through the medium of trans-Atlantic vessels; and equally certain is it, that if it penetrates into the heart of the country it will be through the medium of railways. Cholera is known to follow lines of travel, and should it resist the efforts of local sanitation and medical skill, and prove a national scourge, the railways will be the medium through which it finds its victims. This is a plain truth which cannot be contravened, and without an utter cessation of railway travel, both passenger and freight, the spread of cholera, should it resist local measures, cannot be averted.

Of course the business of railways will continue just the same and perhaps will be increased through the real or fancied fears of persons flying from infected districts, and therefore, to an unavoidable degree, the railways will be vehicles of contagion; but the public have a right to insist that while the railways must perforce be the indirect agents for spreading the cholera, they should forego no effort to limit their responsibilities in the matter to the unavoidable. Railway sanitation is now being thoroughly discussed for the first time, and if the cholera does come, a fine opportunity will be afforded to put it in thorough practice.

In the matter of carrying passengers who may bear with them in their system or in their clothing, the germs of the disease, the railways are practically powerless, and to almost the same degree are they in the matter of baggage and freight carriage. It will be impossible for railways to prevent the spread of the contagion through their agency by these means, and the public will not be disposed to attribute blame for such a disaster to them; but so far as their own premises are concerned the railways should be, and probably will be, held to a rigid account. Cleanliness in passenger-cars and stations, especially with regard to the water-closets, should be strictly maintained, and thorough disinfection resorted to at frequent intervals. The railway employés should also be instructed in the simple rules of hygiene, in order that they may know, not only *what* to do but *why* to do it. The time was, and not in a period of the remote past either, when for absolute uncleanliness and filth, the water-closet of the average passenger-train proudly bore the palm, and the same indispensable apartment appertaining to the passenger-station was not far behind. Considerable improvement has been manifested in this regard, but there is room for more, and the approach of cholera will be a powerful inducement for further attention in this direction. It should also be remembered that while it is highly proper that great care should be exercised in keeping the toilet-rooms of drawing-room and sleeping-cars in a state of cleanliness, from a sanitary point of view there is by no means the same watchfulness required in these vehicles as in the humbler conveyances—the ordinary passenger-car, and above all the emigrant-car. In the first place, it is fair to assume that the wealthier and well-to-do travelers who patronize the higher and more expensive class of cars, are a little more cleanly in their garments and personal habits than the poorer classes; and secondly, it is from the poorer classes, and especially from emigrants that cholera contagion is expected. Under these circumstances, and from a sanitary point of view, the amount of attention required in maintaining cleanliness and care in railway cars and stations, is inversely commensurate with the conditions and cleanliness of the passengers and occupants.

Another point that is worthy of attention is the exclusiveness of such apartments. The closets of railway-stations are generally open to the public, not only travelers but to anyone who has occasion to use them, and while in better managed roads, the doors of passenger-cars are locked when the cars are on sidings or awaiting departure at terminal stations, it is not infrequently the case to leave them entirely unprotected for hours at a time. Naturally they are extensively in use by tramps and other uncleanly persons, amongst whom the rules of hygiene do not obtain. It would seem wise for the railways to lock the doors of the closets in their stations, requiring the persons wishing to use them to apply for the key, and at the same time to exclude the general unclean public therefrom. The cars should be locked, and especially the closets, whenever they are unoccupied or upon sidings.

The various State boards of health are looking into the matter and numerous courteous letters have been addressed by the boards to the superintendents of railways, calling their attention to the importance of railway sanitation; but this is a matter where the railways should not wait to be instructed or informed. If they—the railways—are to be the medium for the spread of cholera, or of any contagious disease, it is their place to see to it that they are merely carriers of contagion on other people's persons and property, and that so far as the persons of those under their own control are concerned, and more especially their own premises, no failure nor laxity on their part shall contribute to the horrors of an epidemic.

EDITORIAL NOTES.

THE stockholders of the New Jersey Central have finally decided to manage the road themselves until the Philadelphia and Reading are able or willing to pay the dividend agreed upon under the lease of two years ago. The stockholders have been patient, and can hardly be blamed for their action, but there is a straw or two indicating the possibility of the absorption of the Central system by the omniverous Baltimore and Ohio. The rumor that the Pennsylvania was bidding for the control of the Central is emphatically denied, and it is stated that the managers of the latter road are perfectly willing that the Central should pass into the hands of their rivals, the Baltimore and Ohio. Such complacency, however, is not shown in Philadelphia, where a lively contest is in progress between these venerable lines over the Baltimore and Ohio's entrance to the city.

* * *

THE Suakim-Berber Railway which was to "smash the Mahdi" is to be abandoned. Somehow the Mahdi does not "smash" well at all, and he retains his rotundity of proportions despite the full-dress campaign of that eminent tin soldier, Lord WOLSELEY. We suppose that the railway will now go into the hands of a receiver, *a l'Americaine*, and would suggest the propriety of appointing the Mahdi to the position. Being well and favorably known in the Soudan, he might conduct the road with profit and charge a nickel to the Arab children for the privilege of riding on the line.

* * *

BUT England is not through with military railways yet, and is now pushing one in Afghanistan, while Russia also has a keen eye to the utility of railways from a strategic point of view. What a vast bearing upon warfare railways are beginning to have, and how unfortunate, or fortunate, that they were not sooner operated! Had NAPOLEON been furnished with a railway, who knows but what the face of the world would indeed have been changed, and the disastrous return from Russia be but the triumphal journey of a conqueror? But seriously, judging by the incapacity of British generalship, would it not be wise to confide the possible campaign in Afghanistan to English railway managers? It will probably be a mere question of railway construction at best.

* * *

THAT there is nothing new under the sun is evident from reading a recent paper submitted at the meeting of the Royal Asiatic Society, at Shanghai, China. In this paper it is announced that telephones were in practical use in China centuries ago, and mention is made of one CHIANG SHUNSHIN, of Huichou, who flourished in the Flowery Kingdom during the seventeenth and eighteenth centuries, as the inventor of the "thousand mile speaker." This ingenious device rivals the phonograph as a work of utility, and it consisted of a sort of fife in which communications were whispered, and subsequently released, though we are not informed of the precise method of accomplishing this interesting feat. EDISON and BELL are thus thrown into the shade—and possibly BARON MUNCHAUSEN.

* * *

THE committee appointed by the United States Senate to consider the much vexed question of Inter-State Commerce, lately held a session in this city and listened to the views and opinions of a number of prominent merchants and railway men. While they may not do much to further the advancement of Senatorial meddling with railways, they will learn a few things that may be of use to them. Prominent among the results of their session, it is hoped, will be the appreciation of the fact that there are a few persons in this world who know how railways should be run apart from the majestic legislator.

* * *

OF all the railway associations, and there are a number of them, there are probably none whose deliberations are

awaited with a keener interest than those of the Master Car-Builder's Association, and the Association of American Railway Master Mechanics. Both of these associations will hold their annual meetings next month, the former at Fortress Monroe, Va., on Tuesday, June 9th, and the latter at Washington, on Tuesday the 16th. The proximity of these meetings, both as to time and place, will probably insure a goodly attendance at each.

* * *

IT is a somewhat surprising fact that while the year 1880 was, from a railway point of view, one of the most progressive of years, the Massachusetts railways found last year much more so. Unfortunately the experience of Massachusetts is not that of the whole country. It is claimed that this good showing is attributable to the intelligent labors of the Massachusetts Railroad Commission, but a large number of persons are ready with the simpler explanation that it is "one of those things no fellow can find out."

Outing, a publication originally intended as the exponent of bicycling interests, has now grown to the proportions of a handsome monthly magazine devoted to recreation in general, and interspersed with readable poetry and fiction. The number for May is a beautiful one from an artistic standpoint, and the character of its contents excellent. In the matter of illustrations it compares favorably with any of our monthly magazines, and appears to be steadily improving.

The Alienist and Neurologist, a medical review issued quarterly under the editorship of Dr. C. H. Hughes, of St. Louis, is received, and contains a number of common-sense papers on the treatment of mental and nervous disorders. Among them is an exceedingly interesting article by the editor on the subject of "State Provison for the Insane."

THE familiar "bad boy" who is becoming a character in American literature, has apparently not subsided—at least so we learn from an amusing book published by J. S. Ogilvie & Co., of this city, in which his domestic adventures are chronicled under the title of "The Bad Boy at Home."

The Quiver, published by Cassell & Co., of this city, contains, as usual, a large amount of interesting and instructive reading, together with a number of handsome illustrations.

Two new and interesting exchanges are acknowledged in the receipt of the *Railway News* of Philadelphia, and the *Photographic Times and American Photographer*, of this city.

The Railway Magazine is the title of an attractive little publication issued by Geo. E. Allen & Co., of Buffalo, N. 1.. and devoted to travel and transportation.

Baldwin's Official Railway Guide for May, is received, containing the latest changes in railway trains.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

STREET-RAILWAY MONOPOLY.

HOWEVER much the public may decry monopoly, in the matter of street-railways they experience a positive and direct benefit if all the roads in one city are under the control of a single company. The actual ownership of the roads need not be vested in a single corporation, but the control of all being vested in a single management invariably is productive of good results so far as the traveling public is concerned. While not urging a consolidation of street-railway interests in our larger cities, we nevertheless, feel constrained to make the above statement in view of the fact that charters and franchises for new roads are often opposed on the ground that the promoters are already possessed of one profitable road, and that there should be no monopoly in street-railway operation.

In large cities street railways may be operated separately and absolutely independent of each other without detriment to the traveling service, chiefly owing to the reason that they are not brought in direct conflict with each other's interests and may cater to the needs of different sections of the cities; but in the lesser towns, where more than one or two roads are desirable, and yet the bulk of travel is not sufficiently large to warrant competition, it has been found not only more practicable from the traveler's standpoint, but also more profitable to the companies, to unite under one management, and supply the needs of the community without direct rivalry.

Especially is this the case where two or more lines operate in the same avenues of travel for a considerable distance. Under separate control, and each striving for the bulk of patronage, it is likely that the accommodation will be more than sufficient, and certainly more than can be made profitable. Cars of one line will lag purposely behind their schedule time with the intention of delaying the cars of a rival line and securing all the travel on the same street or avenue. As a result it is generally the case that the cars of the different roads will be "bunched" and travel in pairs or threes, while between these gregarious trips, disheartening periods will pass

during which the public have to walk. Such policy would seem suicidal, yet it is frequently pursued, and a large amount of travel is lost to all the lines in the eagerness of each to obtain more than its share.

Should, however, these competing lines combine under one management and control, and should each line be regarded as a separate money-making factor of a common treasury, the public can be better accommodated and the aggregate of travel will be greatly increased. The total number of trips can be considerably lessened, while the public requirements will be better served, for one car run every ten minutes is certainly a better arrangement for the public than two cars run every fifteen minutes yet following each other so closely that a single car would answer every purpose, and the economy in running expenses is reduced a very appreciable degree. Under one management several competing roads may be run with profit in a moderately large city, but under separate management such a result is doubtful, and it is highly probable that none will be found to afford ample profit on what may be termed local traffic, or in carrying short-trip passengers.

Another great advantage to be derived from the combination of interests is in the adoption of transfer tickets, by which passengers can travel to various points by being transferred from different cars, and while it is possible that a transfer system might be conducted between separate roads, it will never come into general use save where all the roads are under one control. In affording the public increased accommodation by the adoption of a transfer system, we should imagine the street-railways would open a profitable field of traffic with little extra expense, and having a common treasury there could be no question as to the division of payment for such fares.

From a purely selfish view that portion of the traveling public who oppose street-railway monopoly, or the control of more than one line by a single company, are making a great mistake. In every way their interests would be better served were such a monopoly to be put in force, and when they oppose it they are decidedly "barking up the wrong tree."

THE Philadelphia Courts have decided in a recent case, that when a passenger upon a railway goes upon the platform of a car in violation of the company's rule, he has no ground of action in case of injury. This is as it should be. When a road offers to carry passengers there is no reason why it should also be understood as acting in the capacity of a dry-nurse toward its passengers. If they persist in violating well-established rules and meet with injury, passengers have no right to plead the "Baby Act."

* * *

AN increase in the receipts of the New York and Brooklyn Bridge shows that the recent reduction of fare on the bridge-cars was productive of good results both to the public and the bridge. The next step of importance will in all probability be the abolition of the tolls for foot-passengers, which would seem to be a wise move. Certainly when one of the trustees suggests selling five promenade tickets for one cent, it strikes us as a good time to do away with the "cent" business altogether.

THE PROBLEM OF RAPID TRANSIT.

BY EDWARD E. R. TRATMAN.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE recent decision in the case of the Irving National Bank of New York, against the Ninth Avenue Elevated road has again revived the opinion that the granting of the use of the streets for these roads has not been such a decided advantage as was first supposed; and the question again suggests itself: "What is to be the future of the 'L' roads and Rapid Transit in New York?" In this case, which it must be remembered, though now but a solitary one, may be taken for an example by owners of property similarly affected, the Bank asked for an injunction against the operation of the road in question on the plea of past and present damage to property and general nuisance. This was granted, and the damages sustained were assessed at a sum of over $10,000 including interest. If the road is to continue in operation, the company must avoid the injunction which it can only do by acquiring the property in question, for which a price satisfactory to the owners must be given, with the result that the company will be saddled with property it does not want, of which it has itself reduced the value as regards future use, and for which it will have paid in addition to the purchase-money over $10,000; while all this, though surely bad enough, is capped by the uncomfortable idea that by the time it has all been done and things settled in this one case, others may arise to disturb the harmony and form a continual drain upon the coffers of the railway company.

Companies which purchase the land required for their roads and pay compensation in the first place for damage to other property under the general railway laws, have, it is true, a considerably greater first cost than companies which build their lines after the manner of the New York elevated roads; but they have no subsequent suits for damages to property, and have the satisfaction of knowing that the resources will not be dipped into by compulsory purchases, at a high price, of property which will be almost useless when bought.

The multitude of lines which afford accommodation to the city and suburbs of London, England, are arranged after very different plans. The Metropolitan and Metropolitan District Railways are constructed almost entirely in tunnel or covered-way ("cut-and-cover") through the city section of their lines with occasional openings, some temporary and some permanent, on vacant blocks, companies' land, etc. They are laid out to tap the centers of business and pleasure, and the residential districts to afford communication with the main lines and territorial stations, and to accommodate the most important routes of city street traffic, which requirements they well fulfill. Owing to the shape of the city, these lines form a continuous belt of irregular shape with various branches and connections to all the main lines at their

large terminal stations and elsewhere; so that cars can be taken right from any trunk line to almost any part of the city. The North London Railway has a large portion of its lines, including its four-track branch into the very heart of the city, carried on a brick viaduct, the arches being leased as stores, stalls, etc. Small streets are crossed by the arches, and wider ones are crossed by iron-plate girders. Neither roads nor railways are allowed to cross other roads on a level but must go over, under or around. Of the vast number of main lines and their endless local ramifications which surround and penetrate into London, some few are in cutting with retaining-walls (property being too valuable to allow of earthwork slopes, excepting a few places where sufficient land was originally acquired before the ground became valuable), but the majority are constructed on high brick viaducts of which there are miles and miles, forming a complicated network in the outskirts of the city and the suburban districts. Nearly the whole of the city population lives outside, at distances varying from one to fifty miles, and the traffic over all the roads—inward in the morning and outward in the evening—is something enormous, the North London Railway alone despatching trains of twelve cars every few minutes during the busy hours, nearly every train then being filled to its utmost capacity, while the other metropolitan lines and the local connections of the main lines have about the same average amount of traffic.

The underground railways have proved a success in almost every way except ventilation; but were a new line of this character to be undertaken, this objection would very probably be obviated, for our knowledge of the principles of ventilation has greatly increased since those lines were built, and improvements are constantly being made in the manner of applying these principles to practical uses, while should electricity be adopted as a future motive power, this question would be considerbly simplified.

Vienna, in Austria, is about to construct an iron elevated railway, which, however, will not be laid through the streets, but will form a "circle" after the manner of the route of the London underground lines.

Considering the question of the motors, it is very evident that ordinary steam-locomotives are not suitable for the elevated lines on account of their noise and the amount of dirt and water they scatter over the roads. Compressed-air, gas, fireless steam-locomotives and other plans have been attempted but with little practical success. The cable system seems distined to a great future, but the plan which seems to offer the greatest advantages is that which has electricity for its motive power, either on the *storage* system in which the electricity is carried in "accumulators" in the car itself, or the *conducting* system in which the electricity is generated at certain points along the line and conveyed through rods running alongside or in the middle of the track, whence it is taken to the machinery attached to the locomotive and touching the rod. Street-cars have been worked by electricity on the former system and a short line of railway is in regular operation on the conducting system in the north of Ireland; while a project was brought before the notice of the writer not long ago to work a system of light railways on this plan, the electricity being generated by the natural water-power of the district. For underground roads it is far preferable to steam and nearly all other methods, and with it the Broadway Arcade Railway might be a practicable and successful scheme.

As to the rolling-stock for city railways, the English plan of having doors at the side has the great advantage of enabling a long, crowded train to be emptied almost immediately, since, when a train runs alongside a platform, there is a door to every ten passengers, while in a dock between two platforms, as is usual at terminal stations, there are two doors available, or one to every five passengers. The cars on the London railways average 28 ft. in length and 8 ft. in width, weigh about 8 tons (= 17,920 lbs.), and are carried by two pairs of 42-inch wheels on the ordinary English plan. They have five compartments, each accommodating ten passengers, five on each side, making a total sitting accommodation for fifty passengers to each car, though of course in busy times standing passengers increase this number about one-half. Probably a modification might be desired to combine the advantages of the American and English styles of construction. The trains are "close coupled" as a rule, that is, the cars are drawn close together and never uncoupled except for repairs, etc. Before leaving the consideration of the rolling-stock, I would say for the information of a correspondent of the January number of the JOURNAL, that the cars are for the most part roomy and well-furnished and well-lighted, gas being used on nearly all trains for distances up to ten or fifteen miles. Smoking compartments are used as such all the life of the car, and the windows are washed daily as anyone may know who has stood in one of the large yards and seen the gangs of men swarming inside and outside of the cars, washing, cleaning, brushing, dusting and polishing.

The London stations possess great advantages of accommodation over those on the New York elevated roads, for not one is without its separate waiting-rooms for men and women; its urinals, water closets (which should be considered absolutely indispensable in every case), and other conveniences, while the buildings are more commodious and substantial.

Comparing the underground lines, the iron elevated roads through the streets and the brick viaducts on the railway company's own land, the advantages would seem to be largely in favor of the latter. The companies have no lawsuits for damages to property after the road is built; the rent of the arches brings in quite a considerable sum; the ventilation is good; there is no obstruction or nuisance of any kind in the streets; ordinary locomotives may be used without being a nuisance; the noise is considerably less than on the iron viaducts of this city, and the route can be laid out with regard to favorable grades and curves, and to touch or avoid certain points, since it is not confined to the location of the streets, while heavy freight and general traffic can be accommodated, for all the traffic, local, through, mail, express, freight, etc., travel over the London roads night and day.

If, as has been suggested, the "L" roads cannot be regarded as a final solution of the Rapid Transit question, it would seem wise to consider the advisability of adopting a system of railroads on brick viaducts on land belonging to the railway company, since such a plan appears to comprise the greatest advantages for cost, conveniences and carrying-capacity.

THE LIABILITY OF STREET-RAILWAY COMPANIES FOR NEGLIGENCE.

BY O. S. BRUMBACK.

[A Paper read before the Convention of the Ohio State Tramway Association.]

(*Continued.*)

I. LIABILITY OF STREET-RAILWAYS TO THE PUBLIC FOR WANT OF CARE.

THE first division, liability to the public, we will consider under two sub-divisions: *a*, liability to passengers, and *b*, liability to those not passengers.

a. LIABILITY TO PASSENGERS.

Street-railways are what are technically called common carriers—that is, the law regards them as a partly public institution, granted special rights and power for the public benefit. And in return for these privileges, holds them to a special accountability for the fulfillment of their duties in a safe and careful manner. Chief among the special rights so granted to street-railways, is the right to carry passengers and charge a toll therefor. In so doing the law presumes a contract between the carrier and the passenger, that the carrier will transport the passenger carefully and safely, and to that end must exercise the greatest care.[9]

In this class of cases, then, where passengers are injured by the negligence of the railroad company, the proof of the injury establishes a *prima facie* case of negligence.[10] Passengers are, as it were, the guests of a common carrier, and, while it does not insure their safety, it must still exercise the highest degree of care and prudence in their safe transportation.[11] Nor can a common carrier restrict its liability for such great care by a special contract with a paying passenger. Indeed, it is questionable whether it could do so with a free-pass passenger,[12] being against public policy.

It has likewise been questioned, but not decided, in one Ohio case, whether a common carrier can be held to warrant the good conduct of a servant toward a passenger.[13] This same case, however, clearly decides that a railroad company is not responsible for the wrongful act of a servant *outside* the scope of his employment, as in this case, where the baggage-master struck a passenger with a hatchet.[14] This case is cited and approved in the case of *James Healey* v. *The City Passenger Railway Co.*,[15] where it is expressly stated that a company is liable for the excessive force and violence used by a car *driver* in ejecting a person for non-payment of fare, *provided he has any authority to collect fares;* so also a conductor.[16] As a rule, in ejecting a person from a car, no more force or violence must be used than necessary. Whether the car should be brought to a stop before ejecting the passenger is a question for the jury to decide under all the circumstances.[18] As a rule, however, the car should be stopped, or its speed so slackened that the person may leave it safely.[19] In other States where the question has arisen, street-railways are held liable for injuries to passengers caused by being compelled to stand on the platform when the car was crowded. While the company is not bound to provide seats, yet it must answer in damages if the passenger is injured without fault of his own by being compelled to stand on the platform.[20] Riding on the platform is not contributory negligence in itself,[21] but the passenger must place himself in as safe place and position as he can find.[22]

From these illustrative cases, we see street-railroad companies are bound to use the greatest precautions to keep their passengers unharmed. The cars, track, harness, and other paraphernalia must be kept in good repair, and servants must exercise the utmost diligence to prevent accident, for if injury should result to a passenger because of any lack of great care, and he should not be guilty of any contributory negligence, a good case for damages would be made.

b. LIABILITY TO THOSE NOT PASSENGERS.

To the general public at large, meaning all those who are not passengers, street-railway companies owe a far less degree of care, being what is generally denominated as "ordinary" or "reasonable" care, such as any reasonable man would exercise under the circumstances.[23] In the case of *Pendleton Street R. R.* v. *Shires*, Judge Brinkerhoff says: "Street-railroad employés are bound to the highest degree of care and prudence . . . . . with a view to secure the safety of their passengers. In respect to the members of the general public, (not being passengers), they are only bound to exercise what amounts, under all the circumstances of the case, to ordinary care and prudence."[24] This was a case where the team of horses got away from the car and ran over Mrs. Shires, greatly injuring her. In another case[25] the court says: "It is ordinary care for a street-car driver to watch his horses mainly, and to what can be seen in front without looking back. . . . . But if he sees any danger in other directions, it is his duty to stop." The rule of contributory negligence is alike applicable in these cases, as indeed, in most cases of negligence. The plaintiff who seeks to recover must be without fault. There is a exception in Ohio to this rule—in cases of children who have not reached the age of discretion—negligence is excused in them, care not being required of one so young. Even though the parent or guardian is careless in allowing the child to be upon the street unprotected, yet the company will be held liable if there was any neglect or carelessness on the part of its servants, although the child itself contributed to the injury.[26] So that here, again, *great care* must be exercised to prevent injury to children. In such a case the company can have no benefit of contributory negligence, and could only hope to show itself without fault, to avoid liability.

9. 19 Ohio St. 12.
10. 4 Bull 11; 38 Ohio St. 461; 1 Thompson Neg. 46.
11. 30 Ohio St. 451; 19 Id. 12.
12. 19 Ohio St. 13.
13. 19 Ohio St. 133.
14. 19 Ohio St. 110.
15. 28 Ohio St. 23.
16. 21 Ohio St. 518.
17. 3 W. L. G. 90; 32 Ohio St. 345.
18. 28 Ohio St. 23. Citing 118 Mass. 228.
19. 5 Allen, 557.
20. 1 Sweeney 298, 490; 34 N. Y. 670; 67 N. Y. 596; 33 N. Y. Sup. Ct. 392.
21. 87 N. Y. 63.
22. 36 N. Y. 135.
23. 8 Ohio St. 570.
24. 18 Ohio St. 225.
25. 1. C. S. C. Rep. 180.
26. 18 Ohio St. 399; 30 Id. 451.

(*To be concluded.*)

Electric Railways in San Francisco.

IT is expected that in a few weeks the Pacific Coast Electric Construction Co. will have an experimental electric road running from the Southern Pacific depot to the Union Iron Works at the Protrero, in San Francisco.

For some time past experiments have been made in this direction, and the plans are now said to be complete. The road will be similar to the cable-road, only, instead of a cable underneath the track, there will be a negative and positive wire. These, when brought together by the grip of the dummy, will complete the circuit and provide the motive power. When the car stops the wires will be released; thus the power necessary to drive the car will be saved while it is at rest. The generating machines are also so arranged that as soon as a car stops they will cease to generate the amount of electricity to propel the car. Should the experimental line prove a success, electricity as a motive-power will, no doubt, be adopted on many of the street-railway lines in San Francisco.

The St. Louis Cable Road.

OWING to the strong and apparently organized opposition to the one year's extension of time for completion of the work sought by the St. Louis (Mo.) Cable R. R. Co., the company recently discussed the advisability of withdrawing, forfeiting their bond and disposing of the material on hand. At a recent meeting however, between the cable company and the Railroad Committee of the Council, a through understanding was come to and all differences straightened out, mutual concessions being made. Grading was done for two blocks on Franklin avenue, the power-house is nearly completed, the engine and drum are made, and the steel "yokes" are being constructed at Pullman, Ill. The cable, weighing forty-five tons, has been delivered, and the cars are now in the shops of the builders, Brownell & Wright.

Steam Street-Car Motors in Londou.

STEAM-MOTORS for street-cars are coming into extended use in England, but have only just been introduced in London. The motors, which emit neither steam nor smoke, are built by Merryweather & Co., best known as makers of steam fire-engines. The line has some heavy grades, and is six miles in length. The cars are carried on two four-wheeled trucks.

Street-Railway Construction in Cincinnati.

THE Cincinnati Street-Railroad Company notified the Board of Public Works that Rees E. and George F. McDuffie on recently assigned their interest under ordinances and contract with the city in the right to construct and operate Street-Railroad Route No. 21 (the Warsaw Pike and Price Hill Route) to the Consolidated. They desire to proceed promptly, but say they are confronted with the difficulty of doing so properly by the condition in which the work done on Warsaw pike and Hawthorne street has been completed. The original contract requires a metal of sixteen inches, but the pike as completed has only nine inches of metal. This would cause the track, if laid, to stand three to six inches above the metal. They urge the board to have the stakes set for the railway to the established grade, and that the metal be at once provided to complete the street as the track progresses.

Street-Railways in Birmingham, Ala.

THE new line to the base-ball park in Birmingham, Ala., and on beyond to Lakeview, is progressing rapidly and will becompleted within two weeks. The track is laid with thirty-pound iron, as a heavy dummy engine is to be used on this line as motive power. The Georgia Pacific road is building a handsome brick structure on First avenue for its general officers. This road has just completed its repair shops and round house.

The Brooklyn Bridge Passenger-Railway.

DURING the busiest hours of the day cars are run upon the passenger-railway of the Brooklyn Bridge on a minute and three-quarters headway, ten trains of two cars each being operated. It is estimated that the railway could carry 6,000 passengers per hour if pressed, but during the busy hours, at present, not over 4,000 are carried hourly. The reduction of the fare upon the cars from five to three cents has resulted in a consideralbe increase of travel and also in the receipts, the latter being forty per cent. greater than before the reduction.

STREET-RAILWAY NOTES.

ANDREW TRIMBILL, secretary of the Ewing Avenue Street-Railway Company, of Chicago, which has been granted an ordinance by the village trustees to construct a street-railway in South Chicago, states that the company has begun work on the construction of the line. Ties are being laid along the proposed route, and the rails are on the way from Cleveland, Ohio.

THE first cable-car over the Ninth street incline of the new street-railway in Kansas City, Mo., descended recently on its trial trip to the Union depot. The test was entirely satisfactory, and the road will shortly be opened for business.

ATTENTION is called to an advertisement in this issue of the JOURNAL, of the Peoples' Passenger Railway Co., of Philadelphia, in which the company offer a number of street-cars for sale.

IN the department of New Inventions of this month's JOURNAL, is published the description of an improved fare-box for street-cars.

THE cable railway of the North Hudson County (N. J.) Railway Co. is expected to commence running by July 1st.

A NEW cross-town line from Hamilton ferry, Brooklyn, to the bridge, is to be constructed by the Atlantic Avenue road.

THE Philadelphia City Passenger-Railway has been, leased to the West Philadelphia Railway Co.

THE Fonda (N. Y.) & Fultonville Street-Railway has been abandoned and the tracks removed.

WORK is shortly to commence on a street-railway in Oswego, N. Y.

THE Brooklyn Elevated road is now in successful operation.

A NEW street-railway is to be built in Charleston, S. C.

New Inventions.

Vaughan's Car-Coupling.

FRANK VAUGHAN, of Elizabeth City, N. C., has recently invented a new form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a perspective view of a car provided with the coupling; Fig. 2, a vertical section of the link and spring through the line x x on Fig. 1, and Fig. 3 is a side view of the two couplings on different cars in the act of coupling, the draw-head being in section.

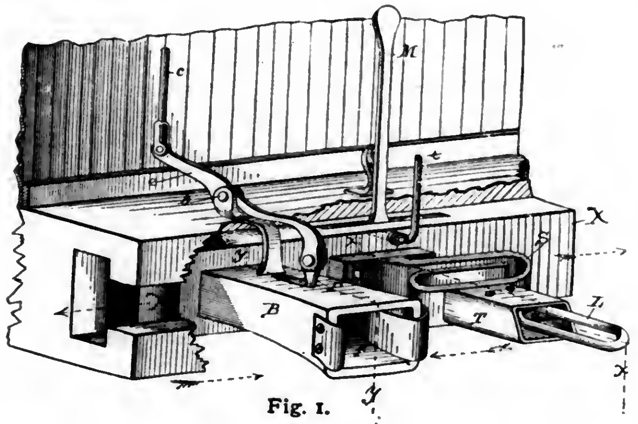


Fig. 1.

VAUGHAN'S CAR-COUPLING.

S is a spring, which may be of the coiled elliptical form, as shown, or spiral, or of other shape. This spring is firmly attached to one end of the sliding plate X, which is arranged in guides upon the ends of each car, and is adapted to slide transversely to the car, as indicated by the arrows in Fig. 1. B is the draw-head, which is attached to the sliding plate at its other end, and just beside the spring. In the draw-head are arranged U-shaped springs *f*, which extend back into the throat of the draw-head, and also outside and around the side edges of the draw-head, as shown. P is a coupling-pin, which passes through a slot in the top of the draw-head, and which pin is at its upper end jointed to the lever *e*, fulcrumed at *b*, and worked by a rod, *c*, to raise or lower the pin. T is a casing attached to the spring S, and in which is contained the butt-end of the link L. This link is connected to the casing T, and spring S, by a ball-and-socket joint, A, that allows the link to oscillate vertically or side-wise. Inside of the casing T are arranged springs *a a*, which hold or bring back the link to a horizontal position. The lower side of the casing T is by preference made a little longer than the upper, to sustain the link securely.

In making use of the coupling, the frame X, on one car is adjusted so that its link will be in the middle of the car, and the frame X, on the other car, is adjusted so that its draw-head will be in the middle of the car. Then as the cars come together the link L, of one car enters the draw-head of the other, and, pushing back the jointed coupling-pin P, allows the latter to fall through the link and couple the cars. Then when the draft-strain is exerted the lower end of the pin P, catches against a lug *l*, in the bottom of the draw-head, which lug holds the pin and prevents it from pulling out again. For moving the sliding frame X, from side to side any suitable mechanism—such as a hand wheel or lever, M—may be employed.

At *t*, on the frame X, is attached a signal rod, that extend up above the top of the car. At its upper end it bears a board painted red, and is designed to carry a red lantern at night, so cars may be coupled at night as well as in the day, only one red light being at the center.

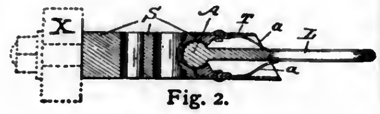


Fig. 2.

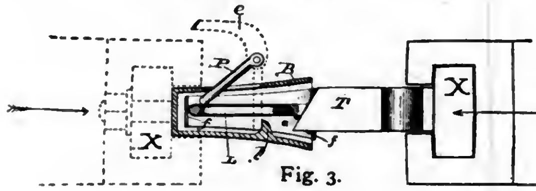


Fig. 3.

VAUGHAN'S CAR-COUPLING.

In practice the sliding frame X, should be stoutly made and strongly connected to the end of the car, or to the under side of the car near the end. To reduce a breaking strain on the spring S, stop devices may be arranged to come into action and relieve the spring when drawn out to a certain distance, as is frequently done in such cases.

Loveless' Spark-Arrester and Consumer.

CHAS. B. LOVELESS, of Worthington, Minn., is the inventor of a spark-arrester and consumer for locomotives which is herewith illustrated and described. The object of the invention is to provide simple and effective means whereby the gas, smoke, sparks or cinders from a locomotive are conducted back to the fire-box thereof and consumed, thus preventing the sparks setting fire to prairies or brush-wood along the line of the road, and also preventing the smoke and cinders passing into the cars; and it consisted in the peculiar construction of the smoke-stack, providing it with an independent conducting-pipe communicating therewith and with the fire-box of the boiler.

In the accompanying cuts Fig. 1 is a side illustration of a locomotive-boiler and fire-box partly broken away to show the conducting-pipe communicating therewith and with the smoke-stack; Fig. 2, a sectional elevation of the smoke-stack and conducting-pipe, showing it connecting with the smoke-box at the front end of the boiler; Fig. 3, an under plan view of the hood which forms the top of the smoke-stack; Fig. 4, a top plan view of the upper end of the smoke-stack with the hood removed, and Fig. 6, an under plan sectional view taken on line x x of Fig. 2.

A represents the improved smoke-stack communicating with the smoke-box B, of the usual boiler C. This boiler is of the kind ordinarily used in a locomotive-engine, and is provided at its rear end with a fire-box D. Immediately under the grate of the fire-box D, is a chamber E, with which communicates a conducting-pipe F, of any suitable size and diameter, this pipe passing up through the smoke-box and alongside the stack A, communicating therewith at its upper end. The upper end of the con-

ducting-pipe F, terminates in a funnel-shaped head G, which is secured to the rim *a*, of the smoke-stack A. At the rear of the rim *a*, is an elongated opening *b*, located directly opposite the funnel-shaped head G, and divided into two independent openings by a vertical partition *c*, which also divides the funnel-shaped head, as shown in Figs. 2 and 4. Upon the smoke-stack A, is suitably supported a hood H, provided with a perforated sheet-metal or wire-gauze screen I. This hood H, is so connected to the stack A, as will allow of its moving horizontally thereon in the arc of a circle to bring it in the direction of the wind.

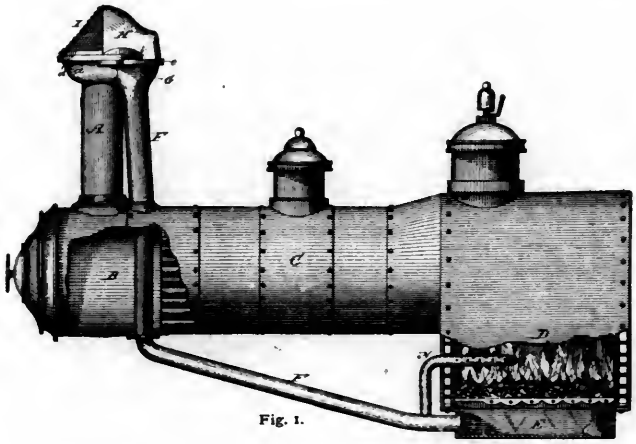


Fig. 1.

LOVELESS' SPARK-ARRESTER AND CONSUMER.

The hood H, is formed with a depending flange, *d*, which fits over the edge of the rim *a*, and also a similar flange, *e*, fitting over the edge of the funnel-shaped head G, which is provided with two or more friction rollers, *f*. A horizontal plate, K, of the hood H, bears upon the rollers *f*, thus enabling it to turn with comparatively little friction. The hood H, is provided with a central rod or spindle, *g*, which turns with it, and is supported by diametrical braces *h i*, connected to the interior sides of the stack A, the lower one, as shown at *i*, forming a step for the reduced end of the rod or spindle *g*, to turn on. The hood H, is provided with a concavo-convex deflecting plate, L, the concave or dished form thereof more effectually catching the smoke. sparks, or cinders as they pass up the stack and throwing them through the opening *b*, into the pipe F. The smoke, sparks, or cinders come in contact with a second deflecting-plate, M, arranged below the plate L, and rigidly secured to the rod or spindle *g*, so that it will revolve with it and give the sparks or cinders a chute laterally and into the opening *b*, as they pass up the stack from the smoke-box B. The plate or partition *e*, divides the funnel-shaped head G, into two separate conduits, each leading into the conducting-pipe F, as shown in Fig. 5, communication being had therewith through the opening *b*, and opening *k*, in the plate K. By this division of the head G, to form two conduits, the wind will strike against the partition *e*, and be driven down through the pipe F, thus preventiug its interference with the smoke, cinders, or sparks as it passes down the other conduit or on the opposite side of the partition; this being especially important when the wind is blowing in a direction at right angles to the direction in which the train is moving. The wind as it passes through the meshes of the screen I, into the hood H, catches the smoke, sparks, or cinders as they are thrown back by the plate M, and thus conveyed through the opening *k*, into the pipe F, from which they are conducted to the chamber E, under the fire-box B, and there consumed. It will be seen that the entire volume of smoke, gas, cinders, or sparks is thrown into the rear part of the hood of the smoke-stack, the wind being drawn in at the front thereof through the meshes of the screen, and not only carrying the smoke, gas, cinders, or sparks through the conducting-pipe to the chamber under the fire-box at the rear of the boiler, but supplying the necessary oxygen to keep up the combustion, a suction being thus created under the fire-box at one end of the conducting-pipe, while at the opposite end, the smoke, sparks, or cinders are being forced through it by the action of the wind. It should be understood that the speed or motion of the engine or locomotive, forces the wind into the hood of the smoke-stack, which conveys the sparks thrown by the exhaust-steam against the screen, back against the rear portion of the hood and into the conducting-pipe leading to the fire-box, the sparks being thrown by each exhaust of the steam against the interior surface of the screen, the suction created in the pipe drawing everything through it to the fire-box.

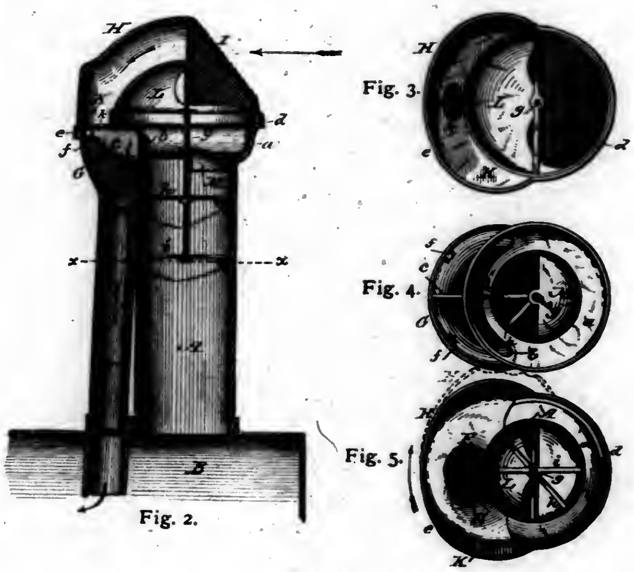


Fig. 2. Fig. 3. Fig. 4. Fig. 5.

LOVELESS' SPARK-ARRESTER AND CONSUMER.

To consume more effectually the escaping products of combustion, the conducting-pipe F, is punched with a branch pipe, N, communicating therewith, and entering the fire-box D, some distance above the fuel, as shown in Fig. 1. The portion of the pipe N entering the fire-box may terminate in a T-branch, a spiral coil, or in any other suitable form found most desirable, and is closed at its ends, and provided with perforations, the object thereof being more effectually to distribute the escaping air mixed with gas and smoke which is unconsumed throughout the area of the fire-box above the flame, in order to ignite and burn up the products of combustion before entering the flues, in addition to that which escapes from the conducting-pipe into the chamber E.

The operation of the device is very simple as well as effective in consuming all products of combustion that would otherwise pass out of the smoke-stack through the meshes of the screen, the gas, smoke, cinders, or sparks as they pass up the stack A, being deflected against the

plate L, by means of the lower plate, M, the greater body of air which enters the cap or hood H, above the plate L, or upon the outside thereof, as indicated by the arrow, passing down the conducting-pipe F, and by so doing creating a suction, which draws the products of combustion through the opening *b*, and carries them with it to the point of discharge, as before described.

The products not drawn through the opening *b*, and which pass above and over the plate L, are carried by the incoming current of air down the pipe F, thus making provision for a complete conduction of the gases, smoke, cinders, or sparks, as they pass up the smoke-stack, to a point where they are consumed.

When the engine is not in motion, the draft and smoke may pass out at the top of the smoke-stack through the screen, provision being made under the fire-box to take in air to supply it when the engine is running backward or remaining stationary.

The device is especially designed for locomotives, but it may also be successfully applied to all classes of moving engines. Through the consumption of the unconsumed gases and other products, which is accomplishied by the device, the inventor claims that a saving of twenty-five per cent. of fuel is effected.

De Lanoy's Mail-Bag Catcher and Deliverer.

HARRY DE LANOY, of Hasting-on-the-Hudson, N. Y., is the inventor of an improved device for simultaneously taking mail-bags from the cranes by the side of a railway track and delivering bags to the same crane, without checking the speed of the car. Although the invention

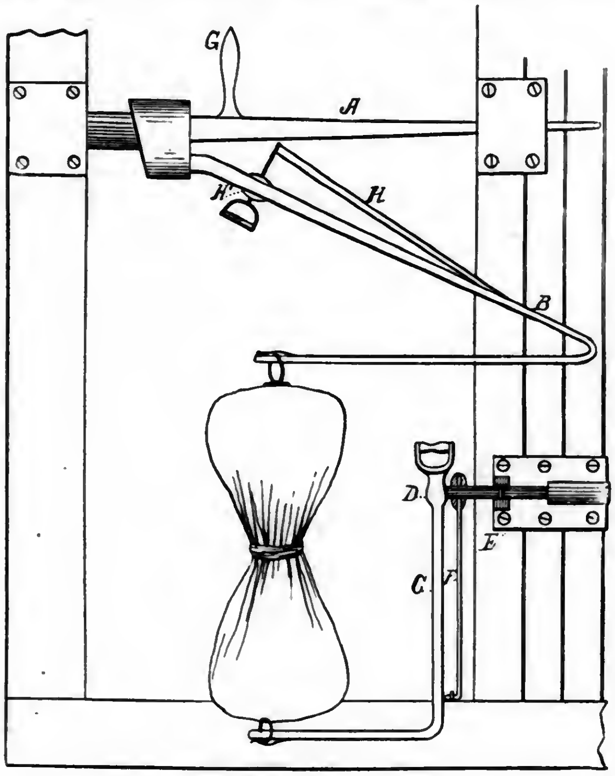


Fig. 1.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

is one of more interest to the Post-office Department as tending to save destruction of mail-bags, and the prevention of loss of mail matter, the adoption would also free the railway service of the danger to life and the destruction of property to which the present system of throwing the bags from the cars exposes the public and the railways, and is, therefore, of interest to the corporations. The device is simple as will be seen by the accompanying cuts and explanation.

Fig. 1 represents the bag on the car ready for delivery. The main bar A, similar in shape to the one in use, and which is used with and rotates in the same fitting now on the cars, has a catcher-arm B, with a rearward extension, at the extremity of which is a spring-clasp hook which holds the upper ring of the bag. The lower ring is at-

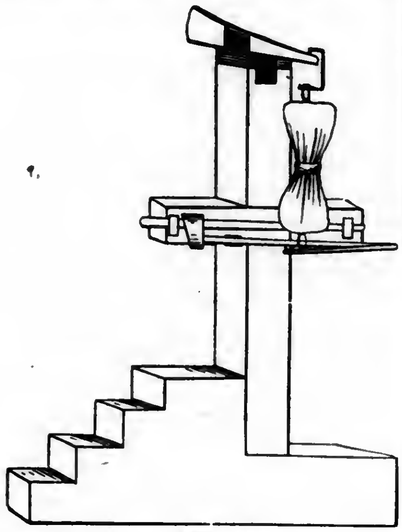


Fig. 2.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

tached to a similar hook at the extremity of the lower bar C, which extremity is brought within easy reach for attachment by the postal clerk on the car, by sliding through the sleeve D, and being slid back with the lower ring of the bag attached, into position, ready for use, as shown in the cut. The lower bar is held to the car by the socket E, with an additional support of a standard F, in which, and the socket, the lower bar rotates.

The lever G, being lowered inwardly by the postal clerk on the car, as shown in Fig. 3, the bag on the car is ready for delivery to the crane, upon which is attached a similar catcher, as shown in Fig. 2 (without the lower bar C, which, of course, is not needed), which represents the crane with the bag ready set for delivery to the car. The single act of the postal clerk on the car, of lowering the lever G, causes the exchange to be made automatically, the machine doing all the work of the exchange positively and without danger to the clerk or the bystanders in the car or on the ground.

The exchange is effected by the bag on the car going behind the bag on the crane, and being deposited in the catcher on the crane; and, simultaneously, the bag on the crane is taken from the crane by the catcher on the car, both bags being caught by the respective catchers, and securely held in each catcher by the long spring H, which, yielding to the pressure of the bag (the end of the spring working through a slot in catcher-arm at the point H,) aids in overcoming the inertia of the bag to some extent, and, after the bag has passed over it, the spring jumps out behind the bag where it is held without possibility of getting under the wheels of the car until released by, in the one case, the clerk on the car, and in the other, by

the local official on the ground. Fig. 4 shows the mail-bag delivered at the station, and Fig 5, a similar mail-bag caught by the car in exchange.

The machines can be applied to any car, using the fix-

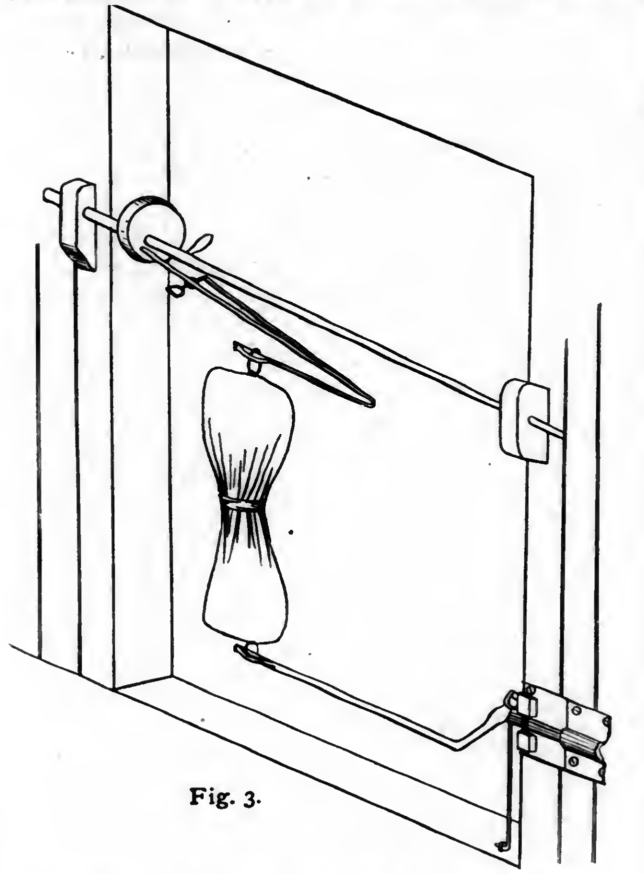


Fig. 3.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

tures now on them, by adding the one socket to hold the lower bar, and can be applied to any crane by substituting a cross-timber to hold the device, for the lower arm now on the crane which holds the lower ring of the bag.

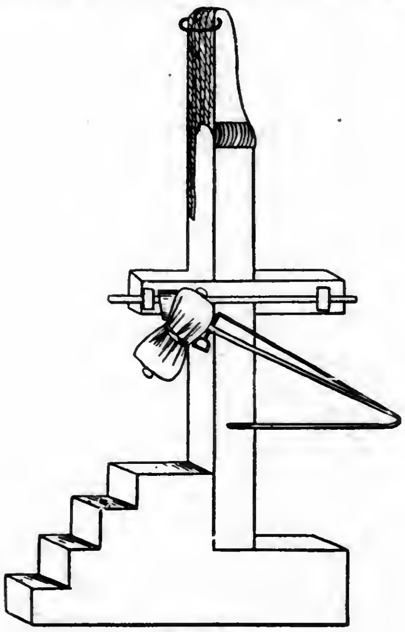


Fig. 4.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

Instances of destruction of mail-bags and mail matter by being cut up, are quite frequent, and cases, also, are known where the U. S. Mail has been missing from one to three days by being thrown out in blinding snow-storms and lonely catcher stations, and lost in snow-drifts and wayside bushes. The ability and intelligence of the Fast Mail Service clerks which have made the service justly famous, cannot guard against such accidents with the very imperfect appliances now in use, which were

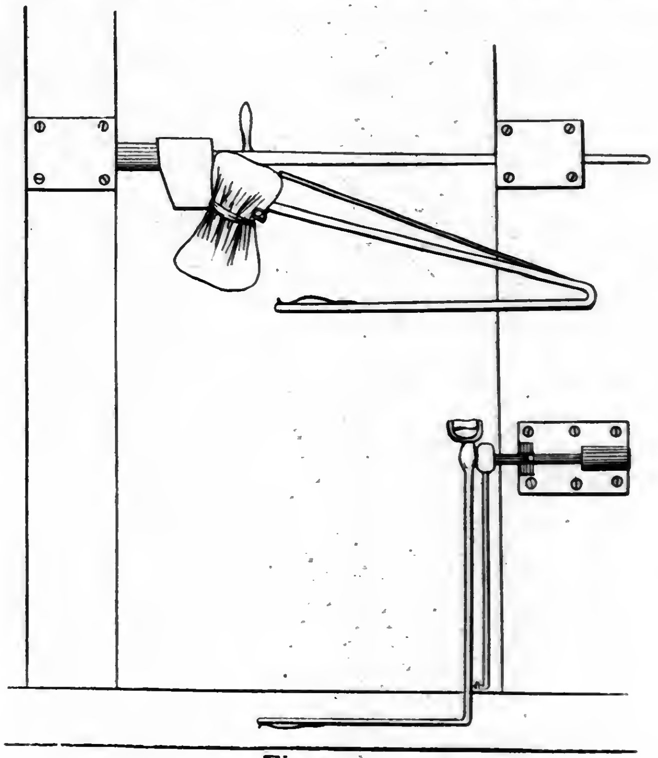


Fig. 5.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

designed to fill the needs when the trains moved at the slow rate of ten miles an hour, and the mails were proportionally light.

The De Lanoy device above described has had a satisfactory, continuous test at two stations on the Hudson River Railroad for the last five months, daily exchanging the regular U. S. Mail-bags weighing from ten to forty pounds, and with the train moving at the rate of thirty-five or forty miles an hour.

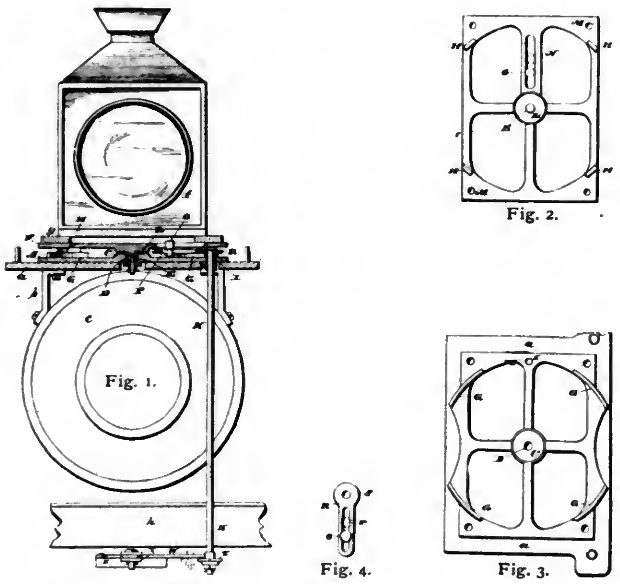
McCormick's Locomotive Head-Light.

JOHN R. MCCORMICK, of Austin, Texas, is the inventor of an improved head-light for locomotives, which is herewith illustrated and described. The object of the invention is to provide a head-light for locomotives that shall be movable either automatically by means of levers or gearing connected with the front truck under the locomotive, or adapted to be operated by hand by means of levers or gearing within easy reach of the engineer; thus enabling him to light up the curves before running upon them, or the straight track ahead, while turning curves.

The new invention consists in the combination, with a head-light of any suitable construction, of a movable plate to which the head-light is secured, a fixed plate, and suitable levers or gearing connecting this movable plate with the front truck of the locomotive, the moving of which latter in accordance with the curves over which it travels operating to move the plate supporting the light, whereby the light is automatically thrown in the direc-

tion required; and also in the combination, with a head-light, of a movable plate supporting the same, and a set of levers or gearing secured to the movable plate and extending to or within the cab within easy reach of the engineer, and by which the light may be turned in any direction.

In the accompanying cuts, Fig. 1 is a sectional view of the device securing the revolving plate in position on the stationary plate; Fig. 2, a plan view of the lower face of the upper revolving plate; Fig. 3, a plan view of the upper face of the lower stationary plate; Fig. 4, a plan view of the lever and pin which operate the revolving plate; Fig. 5, a top plan view showing the levers attached to the center of the truck and connected with the shaft conveying the motion to the revolving plate; Fig 6, a plan view showing the revolving plate connected by rods to the levers within the cab to operate the light by hand, while Figs. 7 and 8 show a modification.



MC CORMICK'S LOCOMOTIVE HEAD-LIGHT.

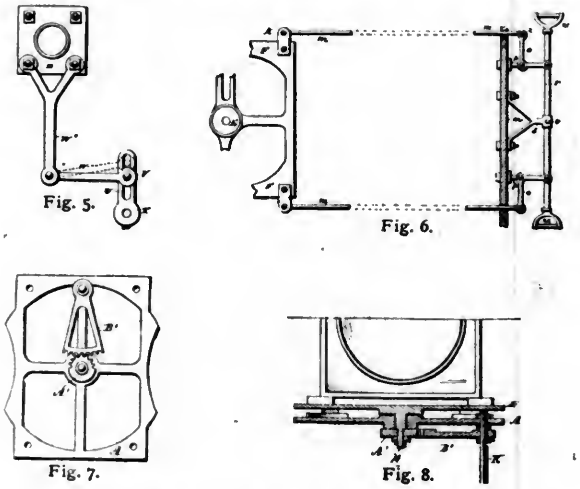
A represents the stationary plate, bolted to a plate *a*, which latter is fastened to the brackets *b*, secured to the boiler *c*. If desired, instead of bolting the plate A, to the plate *a*, it may be rigidly secured to the brackets *b*, thus doing away with the plate *a*. The plate A, is formed with a central hub, C, centrally provided with a hole or perforation D, for the reception of the pin E, attached to or formed integral with the upper revolving plate, F, which latter is also provided with a hub L, on its under face, and bearing on the hub C, of the plate A.

Near each corner of the plate A, and on its upper face, are formed the upwardly-extending lugs or tracks G, the same being curved as shown in Fig. 3. The plate F, has also formed on its under face, and near the corners thereof, the dowardly-projecting lugs H, adapted to bear and move on the trucks G, and support the four corners of the upper revolving plate, F.

The head-light *f*, constructed of any desired pattern and dimensions, is rigidly secured to the revolving plate F, by means of bolts passing through the blocks *g*, and through the holes M, in the plate F, the latter being provided with a slot, N, in which moves the pin O, adjustably secured within the slot P, formed in the crank R. The crank is provided at one end with a hole, S, through which passes a set-screw adjustably securing the crank to the shaft K, adapted to transmit the motion from the front truck of the locomotive. The shaft K, passes through the hole I, in the plate A, to and through the platform *h*, and is secured to the crank T, the latter being provided with an elongated slot, U, in which is adjustably secured the pin V, formed on the end of the link W, which latter in turn is pivoted to the bar W', secured to the center plate, Z, or other suitable portion of the front truck.

From this construction and arrangement of parts it will be seen that when the locomotive enters upon the curve, the truck, in changing its position with relation to the boiler, moves the bell-crank W, accordingly, which, through the intervention of the crank T, and the vertical shaft K, and crank R, moves the plate F, supporting the head-light, in a similar direction to the front truck, thereby operating to throw the rays of light in the direction in which the truck is traveling, and as the pins E, and V, are made adjustable, the leverage can be so increased as to throw the light in and within the direction or circle of a curve for a great distance ahead of the locomotive.

Fig. 6 shows the devices whereby the light may be operated by hand. When it is desired to employ this device, the connection between the truck and the lamp, for automatically operating the latter, is removed or disconnected, and the plate F, on which the lamp is seated, is provided with the pieces *k*, to the outer ends of which



MC CORMICK'S LOCOMOTIVE HEAD-LIGHT.

are loosely secured the rearwardly-extending connecting-rods *m*, which pass through openings formed in the front wall, *n*, of the cab. To the inner side of the wall *n*, of the cab, is rigidly secured the bracket *s*, to which is movably secured the longitudinally-sliding rod or lever *r*, provided at each end with a handle *t*. To the inner side of the wall *n*, are also secured the bearings or brackets *p*, to which are loosely fastened the bell-crank levers *o*, one end of each of which is rigidly secured to the rod *r*, the outer end being fastened to the inner ends of the rods *m*, the lateral arms of the bell-cranks extending in opposite directions. The bracket *s*, if desired, may be provided with a set-screw *v*, adapted to impinge on the rod *r*, and lock the latter when it is desired to secure the head-light in a fixed position. By pulling either the handle *u*, the bar *r*, the latter will slide in the bracket *s*, and by means of the bell-cranks will move the rods *m*, in opposite directions, and thereby move the head-light supported

on the table F, and direct the rays to any point desired.

Figs. 7 and 8 show a modification of the devices for moving the head-light, in which A represents the lower face of the lower stationary plate, and F, the upper revolving plate, centrally provided with a downwardly-projecting pin *w*. To the lower end of the pin *w*, below the plate A, is secured the mutilated pinion A′, with which meshes the segmental gear B′, secured to the shaft K, below the plate A. It will be seen that when the shaft K, is turned it will, through the intervention of the gear and pinion, transmit its motion to the plate F, and thus turn the light secured thereon.

While especially designed for locomotives, the inventor claims that the head-light may be advantageously used upon other vehicles. The parts are so connected as to insure a positive movement of the lamp without danger of breaking, and the parts can be so adjusted as to turn the lamp the precise distance required.

Railway statistics show that 90 per cent. of accidents to trains happen on curves and at night, which percentage, it is claimed, will be largely decreased or cancelled by use of this invention.

The device is patented and controlled by F. E. Ruffini, of Austin, Texas, to whom the inventor has assigned the entire patent rights.

Dunn's Car-Coupling.

WILLIAM DUNN, of Hamilton, Ontaria, Canada, is the inventor of an improved car-coupling which is herewith illustrated and described. It consists of a hook for engaging the connecting link, which hook is provided with an angular hole at its pivot end, and lies in a suitable mortise or socket in the draw-head; and it also consists

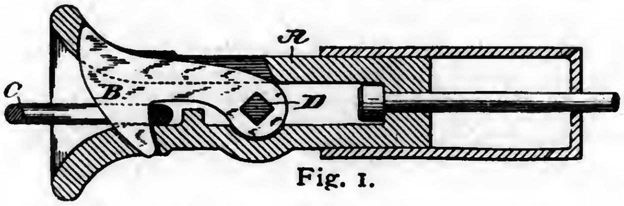


Fig. 1.

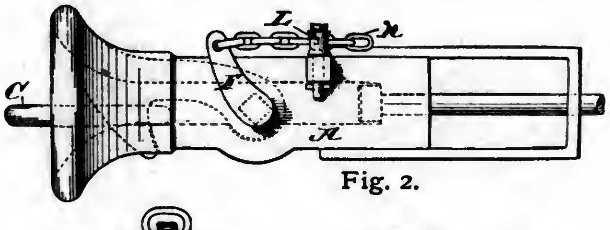


Fig. 2.

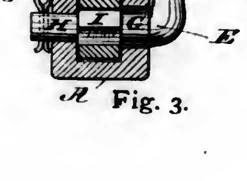


Fig. 3.

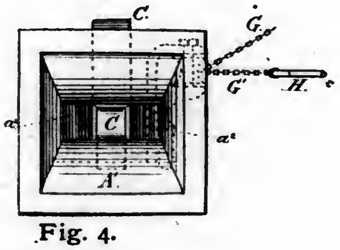


Fig. 4.

DUNN'S CAR-COUPLING.

of a crank-pin for holding the hook in place, this crank-pin being flat-sided where it passes through the hook to correspond with the angular opening in the hook, and to be rigid therewith, while its bearings in the draw-head are circular, the one next the crank-arm being larger than the angular part of the pin, and the one at the other end of the pin being smaller than such angular part.

In the accompanying cuts Fig. 1 is a central vertical setcion of the coupling Fig. 2, a side view; Fig. 3, a vertical cross-section through the crank-pin bearings; Fig. 4, a front view of the draw-head, and Fig. 5, an end view of a car with the coupling attached.

A represents the draw-head. B is the hook that engages with the connecting-link, C. D is an angular hole at the pivot end of the hook. E is the pivot-pin which holds the hook in place in the draw-head. F is the crank-arm on the end of such pin. G is the large circular bearing of the crank-pin in the draw-head. H is the smaller circular bearing of the same. I is the flat-sided or angular part of the pin which passes through the angular hole in the hook. J is a key for holding the pin in place. K is a chain attached to the crank-arm and running to any suitable place or connection, and is for lifting the hook; and L is a chain-pulley for guiding the chain, so that it shall lead from the crank-arm in the proper direction to lift the hook when pulled.

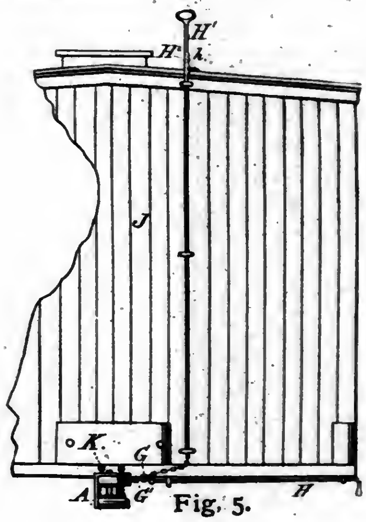


Fig. 5.

DUNN'S CAR-COUPLING.

It will be seen that the smaller circular end of the pin, in order to pass through the hook to its bearing in the draw-head, must be of less size than the flat-sided portion that is intended to be in the hook; also, that to permit the flat-sided portion of the pin to enter to the hook, the hole in the draw-head, through which it must pass, should be as large or larger than such square or flat-sided portion. By this arrangement the crank-pin can be made, by its angular portion, to have such a connection with the hook as is necessary to lift the hook, and this without other means of attachment, and yet can be readily removed when, by reason of being worn out or broken, it becomes necessary to substitute another for it. Furthermore, the flat-sided portion of the pin forms a shoulder which bears against the inner face of the draw-head, and the larger circular bearing forms a like shoulder that bears against the hook, thus keeping the parts in proper relation and preventing binding and chucking when sightly worn.

The recess A′, (Fig. 4) within the draw-head for the reception of the link is only of sufficient length to allow of proper clearances between the end of the link and hook. To insure correct action, shoulders a^2, are provided, against which the end of the link strikes, thus preventing it being shoved too far into the draw-head when the pro-

jected end of the link comes in contact with the pivoted hook contained in a corresponding draw-head. The provision made by the shoulders a^2, compels the link to press against the outer inclined face of the hook of an approaching draw-head, thereby raising it up and allowing the end of the link to pass underneath and behind it, when the hook, by the aid of its weighted head, falls promptly into the central space of the link, thus securely fastening the contiguous draw-heads together.

In Fig. 5 is shown a mechanism by which the uncoupling is effected from the top of the car, and is rendered entirely independent of the jolting of the cars while in motion. The upper part of the rod H′, is provided with notches *h*, which engage with a plate, H^2, for the purpose of holding the hook-bar up when it is desired to "shunt" cars.

The inventor has assigned his patent rights to Isaac B. McQuesten, of Hamilton, Ont., and Calvin B. McQuesten, of New York City.

Schuhmann's Valve for Engines.

GEORGE SCHUHMANN, of Reading, Pa., has recently invented an improvement in the construction of valves for engines, consisting of a balanced slide-valve constructed and combined with the cylinder and an exhaust-chest of a steam-engine, and also the combination of this balanced valve with a cut-off valve. The construction and operation of the device are shown in the accompanying cuts.

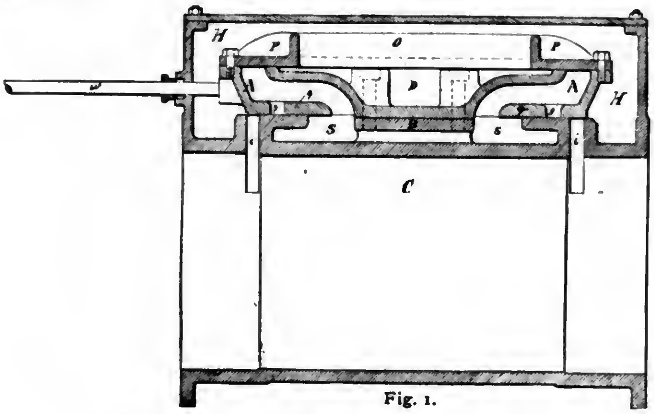


Fig. 1.

SCHUHMANN'S VALVE FOR ENGINES.

Fig. 1 is a sectional view of a cylinder, showing the improved balanced valve and exhaust-chest; Fig. 2, a transverse section through the cylinder and valve, and Figs. 3 and 4 are modifications hereafter explained.

The steam cylinder C, has the usual ports *i i*, but where the exhaust port is generally located there is in this case a steam chamber S, which is in communication with the steam inlet J. The valve proper may be called a sliding steam-chest and consist of a frame A, with two internally projecting plates *q q*, in which are located the ports *g g*. The cover P, is bolted to the frame A, and forms part of the valve-box.

A stationary distance-piece D, is bolted to the bridge B, and forms the seat for the cover P; the valve-stem *w*, is connected to the valve-gear in the usual way. The interior of the valve is always in communication with the steam-chamber S, and the pressure acting on the plates *q q*, will force the valve to its seat on the cylinder, while the pressure acting on the exposed surfaces of the cover P, tends to lift the valve off its seat; consequently if the area of the exposed surfaces of the cover is equal to the area of the plates *q q*, (minus the area of ports *g g*, and overhang), the pressure in both directions will be equal and the valve balanced; but as in certain positions of the valve, steam in one or other of the ports *i i*, assists in forcing the valve off its seat, and as it is necessary to have a preponderance of pressure towards the seats so as to counteract the lifting tendencies of the particles of steam

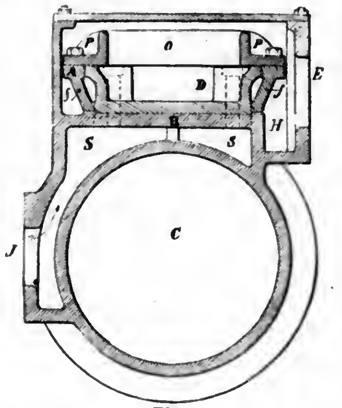


Fig. 2.

SCHUHMANN'S VALVE FOR ENGINES.

that find their way between the rubbing surfaces, the area of the plates *q q*, is somewhat enlarged. The sides *f f*, of valve-box A, project inward for the same purpose. The exact proportion has been determined by experiments. When the valve is in its central position as shown in Fig. 1, the plates *q q*, overhang the valve-seat to the extent of about half the travel of the valve, so that the difference between these two areas, of the plates *q q*, and the cover P, that are exposed to the pressure of the steam, shall remain constant at each end of the valve in every position. The steam after having performed its duty in the cylinder, passes through the exhaust-chest H, and the exhaust-pipe E.

In order to keep the valve tight on both seats, that is, on the cover as well as on the cylinder, it is important that the distance-piece should always be the same height

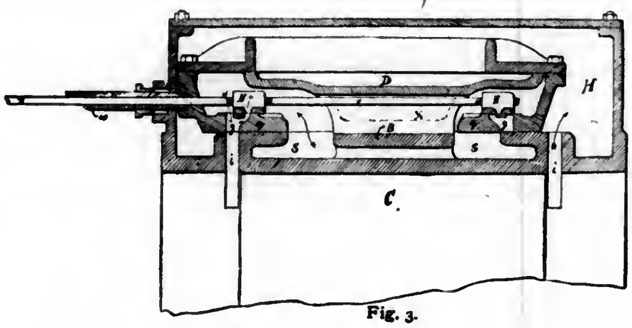


Fig. 3.

SCHUHMANN'S VALVE FOR ENGINES.

as the valve-frame, no matter what the temperature of the steam is. As the valve-frame is surrounded by exhaust-steam and has live-steam inside, the metal will take the mean temperature; by depressing the distance-piece and making a large opening O, in the cover P, so as to allow the exhaust free circulation, the distance-piece will be similarly effected, and by giving it the same thickness of metal as the valve-frame they will always expand and contract alike.

Fig. 3 shows the valve in combination with a Meyers' cut-off, so extensively used on marine engines. The cut-off

valves N N, have their seat on the back of the plates *q q*, the distance-piece has a slot X, cast in, and the main valve-stem is made tubular, so as to allow the passage of the cut-off valve-stem *v*. Extending the valve-frame by adding exhaust-passage *m m*, (Fig. 4) and casting an exhaust port *y*, near each end of the cylinder, the exhaust-chest H, can be dispensed with, or a hot-air jacket may be substituted, and the refrigerating action of the exhaust-steam on the outside of the valve will thus be done away with.

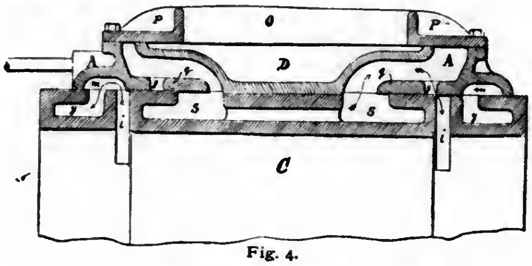


Fig. 4.

SCHUHMANN'S VALVE FOR ENGINES.

After the valve-seat on the cylinder has been planed, the distance-piece and the valve frame are bolted to the seat while the cylinder remains on the planer; then a finishing cut is taken off the top of the valve-frame and distance-piece so as to insure perfect parallelism between the two valve-faces which are afterwards scraped and finished, while steam of the working pressure is in the valve. The face of the bridge B, is a little below the valve-face of the cylinder so as to facilitate the scraping.

By removing the lid of the exhaust-chest, the valve described above affords the freest inspection all around while under working pressure—in fact, the engine can be run with the lid removed. It can, therefore, be fitted until all leakage disappears, and if once tight, it will remain so no matter whether it wears straight, concave or convex, because the wear on both faces is in the same direction, and one cannot wear without the others wearing just as much.

The inventor claims that his device possesses extreme simplicity, having but three parts; that it is durable as the pressure is relieved, and that it is inexpensive, easy of inspection and not liable to derangement.

Barrett's Lifting-Jack.

JOSIAH BARRETT, of Allegheny, Pa., is the inventor of a new lifting-jack, which is herewith illustrated and described. The invention consists chiefly in an application of two alternately-acting pawls, one of them acting at the up stroke and the othe at the down stroke of a lever or handle, for raising or lowering the lifting-bar of the jack. Fig. 1 is a side view of the jack, showing its working mechanism, and Fig. 2 a front view.

A represents a square box, in cross-section, open at its top and bottom, and of about one-half the height of the jack when raised to its utmost. The box rests on a foot *a*, and is supported by braces *b*. At the back of the box is an opening *c*, extending to nearly two-thirds of its height from the foot upward, and in front is an opening *d*, nearly the width of the box, that begins where the former ends, and extends upward to the top, where the box is surrounded by a band *e*. Within the box A, stands a ratchet lifting-bar B, that fills its interior, of which bar the ratchet side is turned forward. From the rear of the lower end of the lifting-bar projects a lifting-piece C, which is raised and lowered with the bar and moves up or down in the opening *c*. To the sides of the box A, where the front opening *d*, begins, are firmly attached two brackets D D′, opposite to one another. These brackets project forward beyond the box, and in them is pivoted a lever or handle E, that has attached to each side of its pivoted end, a disk *f* and *f′*, which disks turn back and forth when the handle is raised or lowered. The disks and the pivoted end of the handle fill the space between the brackets in front of the box. From the inside of the disk *f*, horizontally extends a small shaft or spindle *l*, through the disk *f′*, projecting beyond the bracket D′, at the end of which spindle is a weighted lever *g*; and from the inside of the disk *f′*, extends a similar spindle *l′*, through the disk *f*, and bracket D, with a weighted lever *g′*, at its end. The spindles *l l′*, are at a distance from each other equal to the distances between two notches on the ratchet, and so placed that when the handle E, is held level and a vertical line drawn upward from the center of its pivot, one of the spindles is found at one side of it and

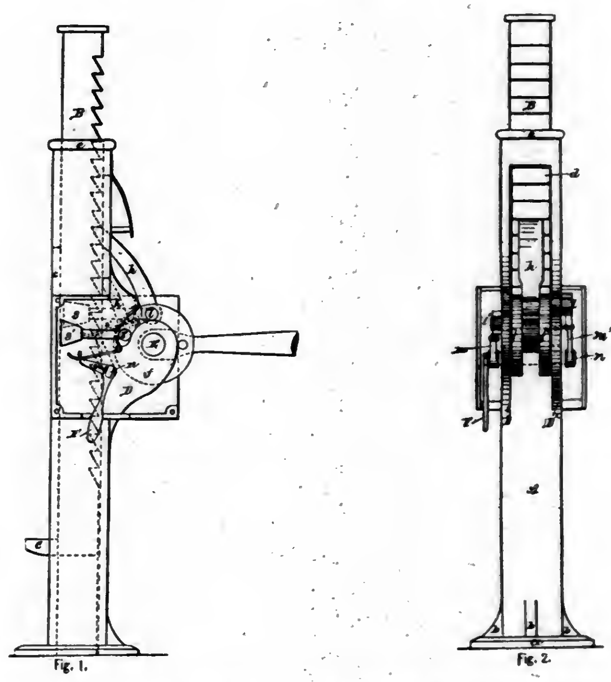


Fig. 1. Fig. 2.

BARRETT'S LIFTING-JACK.

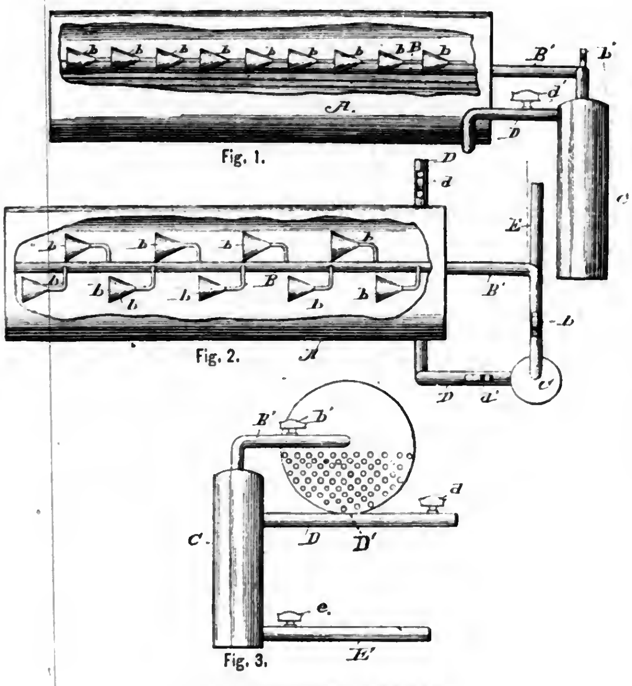
the other on the other side, so that by moving the handle up or down one of the spindles will be lowered as much as the other is raised. On the spindles *l* and *l′*, between the disks *f* and *f′*, are secured two pawls *h h′*, one on each, of which *h*, the longer of them, reaches over the other. The free ends of the pawls lean against the ratchet on the lifting-bar B, and by the alternate motion of the handle one of them is made to lift the bar, while the other enters the notch next presented by the rising bar, and in its turn lifts when the motion of the handle is reversed. To cause the lifting-bar to descend by the same motion of the handle, after having been raised, the lever F, at the side of the box is pushed up, by which a spindle *n*, that projects from both sides, is partly turned. On the projecting ends of the spindle *n*, are cranks *m*, that, when turned up alternately, raise the springs *s s*, attached to the weighted levers, removing thereby the weight or downward pressure that holds the pawls

against the ratchet, and slightly raising the pawls successively. If the handle E, be raised, the lower pawl drops, while the upper holds the lifting-bar; and when the handle is pressed down, the lower pawl upholds the same, while the upper one drops to the notch next above. In this manner the lifting-bar is raised and again lowered by the same motion of the handle, requiring only a change of position of a lever to reverse its direction by being brought in contact with the springs.

The sale of the lifting-jack is controlled by Messrs. Fairbanks & Co., of New York City.

Craig's Boiler-Cleaner.

LLOYD A. CRAIG, of Woodson, Ill., is the inventor of an improved boiler-cleaner for locomotive and stationary boilers, which is herewith illustrated and described. It is the object of the inventor to provide a simple attachment for steam-boilers whereby the sediment may be gathered in the boiler and delivered in a sediment-chamber while the boiler is generating steam.



CRAIG'S BOILER-CLEANER.

In the accompanying cuts, Fig. 1 is a side view, Fig 2 a top plan view, and Fig. 3 an end elevation, of a boiler provided with the attachment. In Figs. 1 and 2 the boiler is broken away.

The boiler A, may be of any desired form or construction, and has extended longitudinally through it the conveying-tube B, which extends at B′, beyond the front or outer end of the boiler and opens into the sediment-chamber C, at or near the upper end of such chamber, as shown. This tube B, has secured on it within the boiler, gathering-bells or funnels *b*, opening at their mouths toward the inner ends of the boiler, and connected at their opposite ends with and opening into the confluent or conveying tube. The number of these funnels may be varied at will, but it is preferable to use a number of them, and to arrange them at close intervals, as shown. A return-tube D, opens at one end into the sediment-chamber, near the upper end of the latter, and has its other end carried to and opened into the boiler at about D′. The sediment-chamber is provided at its lower end with a discharge-tube E. This tube E, has a valve *e*, so that the discharge may be opened or closed at will. A valve *b′*, is arranged in the tube B′, between the boiler and sediment-chamber. A valve *d*, is arranged in the extended end of the return-tube beyond the boiler, as shown, and a valve *d′*, is arranged in tube D, between the boiler and sediment-chamber. The sediment-chamber and the several connecting-tubes are arranged at the outer end of the boiler, and the opposite or inner end is where the fire or heat is applied.

The circulation of water in the boiler is naturally from the fire-place end to the outer end. This carries in such direction the sediment and lime in the water which the gathering devices collect and convey into the confluent tube, by which they are carried into the sediment-chamber, where the sediment is delivered and the water is returned to the boiler. This circulation is kept up by the heat. By closing the valves *b′* and *d′*, the sediment-chamber can be shut off and the water retained in the boiler. The boiler may be "blown" out in the usual manner, and by valves *b′ d d′*, the pipes B′ D, may be also blown out, and the operation may be extended to the chamber C, by opening the valve *e*, in the pipe E.

By the described construction it will be seen the boiler is kept free from deposits by the circulation constantly carrying the sediment, lime and other foreign substances into the sediment-chamber, whence they may be drawn when accumulated in any considerable quantities.

The return-pipe D, opens into the boiler at D′, and is extended beyond the point of connection at D′, and is provided between the sediment-chamber and the point of connection D′, with a valve *d′*, and between the connection D′, and its extremity, with a valve *d*. By the valves *b′ d′*, the sediment-chamber may be cut off from the boiler, and, by opening the valve *d*, the boiler will have a discharge through the extremity of the pipe D, as is desirable in blowing off, etc.; or the valve *d* may be closed and the valves *b′ d′* opened to permit the circulation desirable for cleaning the boiler of sediment while in use.

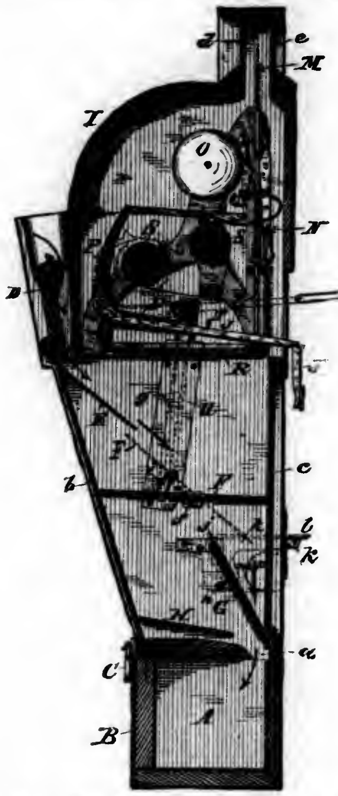
Maltby's Fare-Box Indicator.

CLINTON H. MALTBY, of Dayton, O., is the inventor of a fare-box indicator which is herewith illustrated and described. It is primarily intended for use upon street-cars, omnibuses, and similar public vehicles, but it may also be used in other places where fares are deposited. The invention consists in the combination, with a locked permanent receptacle and temporary retaining and inspecting receptacle, of indicating and recording mechanism operated by a series of keys or levers, under control of the driver or person in charge, whereby the fares and tickets temporarily arrested in the inspection-chamber by the successive operation of the keys and levers have their respective values indicated successively by means of projecting and disclosed tablets, which values, by the same operation that discloses them, are permanently recorded, the indicating and recording taking place while the fares remain in the inspection chamber, so that the occupants of the car, or the persons paying, can see that all are properly indicated and recorded, after which, by the operation

of another and independent lever, the fares are released and fall into the permanent locked chamber, or receptacle.

There is an opening in the side of the box, covered by a grating through which the light at night may be admitted from a lamp in the inspection-chamber. In the present instance there are four levers J, whose buttons are marked "3," "5," "Half T," and "Ticket" respectively, meaning three cents or half fare, five cents or whole fare, half ticket and whole ticket respectively.

By this means an accurate register of all the fares is



MALTBY'S FARE-BOX INDICATOR.

made in the presence of the passengers, whose attention is called thereto by the sound of a gong every time a lever is operated; and this record being inclosed and locked up, cannot be altered or tampered with, and must in every case correspond with the contents of the drawer A. The paper on which the record is made, is consecutively numbered on the back, so that the person unlocking the box cannot abstract any part of the paper, and it is intended that the paper should be sent to the treasurer of the company, and counted to see that it compares with the cash reported. It is a check against the person who unlocks the box and takes the money out.

The inventor has assigned the patent to the National Cash Register Co., of Dayton, O.

An Improved Train-Signal.

THE Pennsylvania Railroad Company have recently decided to equip all their passenger-trains on all divisions of the road with the Westinghouse train-signal, which does away with the bell-rope running from car to car, and gives the conductor and brakemen the means of signalling the engineer at a second's notice. With the present system used on all other roads, of a cord running from the engine-cab to the end of the train, there was always danger of accidents from the inability of the brakemen, especially those on the last cars of a long train, to signal the engineer with unfailing rapidity; as the rope had to be very long it was liable to get entangled.

The pneumatic system adopted by the Pennsylvania road, which has been in use on some of the companys' trains for nearly a year, is simple and effective. A tube containing air at a pressure of fifteen pounds runs from a whistle in the engineer's cab to the rear of the train. The whistle is so arranged that if the pressure in the tube is diminished it will sound and warn the engineer to whistle "down brakes". and reverse his engine. In each car of the train is a valve under control of the brakeman, which upon being opened, allows the compressed air to escape from the signal-tube. The action of the valves upon the whistle in the engine-cab is instantaneous. If an accident happens by which a car is detached from the train or the train breaks apart, the effect is, of course, the same as opening a signal-valve; the pressure is lowered and the signal sounds. The adjustment of this tube from car to car is done on the same principle as that by which the air-air-brake tubes are coupled, and takes far less time than it does to connect the bell-ropes. The same air-pump compresses the air for the brakes and the signal-tube.

Copper Sleeves for Valve-Stems.

[COMMUNICATED.]

KINGSTON, PA., May 12, 1885.

Editor American Railroad Journal:

In the issue of March, 1885, of the AMERICAN RAILROAD JOURNAL I saw an article and sketch of an improvement in valve-stems by using steel sleeves on them.

I have been using copper sleeves on valve-stems of locomotives for over eight years. I put others on when the valve-stems are so worn as to require renewing and I take the valve-stem when in this condition and turn it parallel and to a size suitable to shrink the copper sleeve on, the sleeve being tinned for about one inch on each end and also the corresponding part of the valve-stem. The copper sleeve is then shrunk on and afterwards sweated on. When the valve-stem is not long, the sleeve is made long enough to butt against the valve-rod socket. I think that the copper sleeve is superior to the steel sleeve, as I have found it so with the solid steel valve-stem.

CHAS. GRAHAM,
Master Mechanic, Del., Lack. & Wes. R. R., Bloomsburg Div.

A Test for Lubricating Oils.

THE *Chemical Review* gives the following as a test for lubricating oils: Place a single drop of the different kinds to be compared, in line across the end of a piece of plate-glass about twenty-four inches long, one end being placed six or eight inches higher than the other, to form an inclined plane. The drops of oil run down this smooth plane in a race with each other. The quality of the oil for lubricating purposes is shown by the distance traveled, and the trace left by the drops. Thus, on the first day, sperm oil will be found in the rear, but it will in time overtake the rest, and retain its power of motion after other oils have dried up. A light-bodied oil flows quickly, like water, but also dries, whereas what is needed is a good body compared with a limpid flow. Many oils have a good body, but have a tendency to gum, and will be distinctly shown upon the glass.

THE excellence of Valentine & Co.'s varnishes has again received recognition in the award of two gold medals at tha New Orleans Exposition, one for tneir coach varnishes and one for their railroad varnishes. Each year appears to add increased reputation to the standing of this house.

GEO. H. HOWARD,
Counsellor in Patent Causes and Solicitor of Patents.
IN PRACTICE SINCE 1871.
Washington Correspondent of the Western Railroad Association since 1879.
635 F STREET, N. W., WASHINGTON, D. C.

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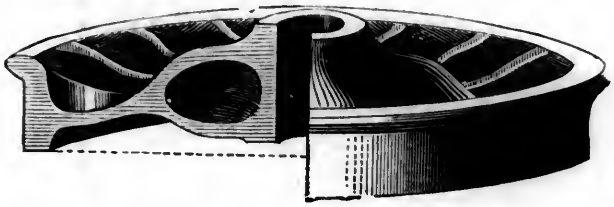
CLEVELAND, OHIO.
Patented 1874, '75, '76, and July 4, 1882.

Ramapo Wheel and Foundry Company.



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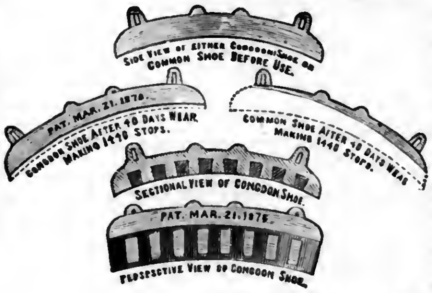

This improvement consists of a brake-shoe having imbedded in its body of cast iron, pieces of wrought iron, steel, malleable iron, or other suitable metal, and while being more effective, in that greater uniformity of friction is obtained when applied, exceeds in life, or the duration of the shoe itself, that of the cast-iron shoe by over *seventy-five* per cent. Its extensive use on many of the most prominent roads in the country has proven its economy and superiority over any other shoe in use. All communications should be addressed to

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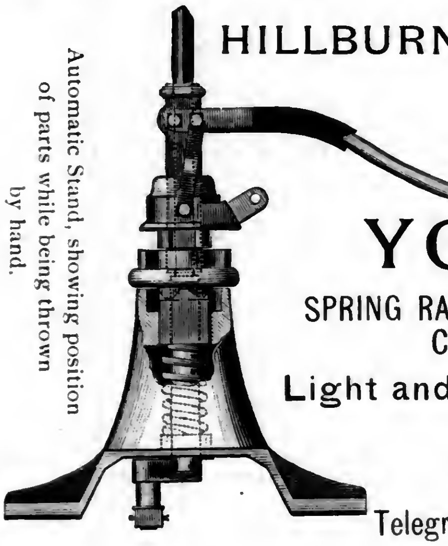

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American Railroad Journal.

WHOLE NO. 2,565.] NEW YORK, JUNE, 1885. [VOLUME LIX.—NO. 3.

RAILWAYS AS MILITARY FACTORS.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

BOTH Russia and England seem fully alive to the necessity of rapidly constructing railways leading to Afghanistan. The notice recently given in the British Parliamennt that £10,000,000 would soon be asked for "building and completing railways in India," and the order given by Russia for "140 locomotives to be completed and delivered within the year," are significant of the vital importance both nations attach to rapid communication between the base of their supplies, and the scene of the coming contest. Diplomacy may delay the latter, but that it will come sooner or later, no one fully aware of the aggressive policy pursued by Russia for more than a century past, can reasonably doubt. After conquering Turkistan, her armies are now ready for battle on soil guaranteed against invasion by England. Her motto seems to be *Vestigia nulla retrorsum.* Steadily has she advanced, and today there exists no intervening space between her and that glittering prize long wished for—British India. Every true Russian is educated religiously to believe that the double-eagle flag at no distant day will wave over the ramparts of Constantinople and the pagodas of Benares, and judging from the past and looking at the present existing situation, it is possible and even probable that this fond anticipation may be fully, or at least partially realized.

When war again occurs in Europe, railways will not be called on to play the role required of them on other continents, where long distances are to be traversed through countries incapable of supplying the wants of an army. The nations of Europe, armed as they are and ready for any immediate outbreak, can find inside of their own territories everything required for hostilities; there are petty sovereignties to be found there, not equal to a common-sized county or even township in the United States. A railway only of 100 miles in length might, in time of war, have each end located in a friendly kingdom, and the middle of it occupied by a power hostile to both. Germany, it is true, in her late war with France, made great use of railways. By them she carried her heavy siege guns to Paris, with all the ammunition they required; but her armies marched to that city by various routes, and gathered most of their needed supplies on the way. The French seem to have made no great attempt to destroy the railway communication. If they did, history gives us no account of it.

Had railways existed in the days of Napoleon, when arbiter of all Europe from the shores of the Bay of Biscay to the banks of the Niemen, undoubtedly he would have used them to their fullest extent. With their aid, his fatal Moscow campaign might have terminated very differently. "Celerity of movement is necessary to success," was a favorite axiom of that greatest modern general. He proved its truth by his first splendid victories in Italy, and equally so at Jena, where rapidly following up his success, he, in less than six weeks, annihilated the military power of Prussia. Nor are these the greatest instances in which he showed his keen appreciation of the value of time in moving an army. When baffled in his attempt to invade England, he hastily broke up his camp at Boulogne, placed 100,000 of his infantry inwagons, and, in what was then considered an incredible short time, had them ready for battle in the heart of Germany.

It is in Northwest Asia, more than anywhere else, that railways will prove invaluable, and even an absolute necessity for military success. Unlike the United States, no assistance can be there derived from transportation by water. The rivers are, as a rule, unfit for navigation abounding as they do in shoals and rapids, common to all streams in a rugged, mountainous country. Some are even perfectly dry for months in every year. Russia has many advantages over England, and fewer difficulties in maintaining an army in a country so miserably adapted to military movements in every way, for the climate is intensely hot in Summer, while in Winter heavy snow storms render all active operations impossible. The Volga river and the Caspian sea afford ample facilities for supplying a Russian army with everything required for an offensive campaign. Reinforcements and provisions landed from the Caspian sea have, or will soon have, rapid transit through Turkistan to Serakhs, only 200 miles distant from Herat by a railway, now or about to be completed. The Russian troops, victors in the battle recently fought with the Afghans, are much nearer the latter city styled from its strategic position, the "Key of India." The Anglo-Indian army stationed at Quatta is, by Sir Peter Lumsden's own admission, fully forty days march from it. If the armed truce now prevailing—it is in reality but little else—should suddenly be broken, the chances are that Herat, in spite of its being strongly fortified, would be in Russian hands, before an army from Quatta could be before its gates.

It is reasonable to suppose that Russia, making due allowance for the exaggerated estimates on paper, purporting to show the real strength of her immense army, can bring against India three men to every one of European birth that England can enlist for its defence. Admitting this to be the case, and that insurrections and rebellions may possibly make the native portion of the Anglo-Indian army far worse than useless, what prompt steps should England take to preserve her Indian Empire intact, and keep it safe from Russian aggression? The answer seems to be a plain one. Railways, and railways alone, can save it. Not detached ones here and there, but a regular net-

work of them. A great central depot must be selected with connecting lines radiating to every point likely to be threatened by a foreign or internal enemy. To carry out thoroughly an undertaking of this kind would, of course, necessarily involve an immense outlay of money, compared to which the millions already asked for would seem insignificant; but the outlay would, in the course of time, be in part repaid. These railways built mainly for military purpose, would in time of peace, rapidly increase the commercial prosperity of India; they would create new markets for England's manufacturers, now far beyond their reach. An Empire which exports and imports merchandise amounting to nearly $800,000,000 annually, is well worth protecting. Military movements in India are from the combined heat of the climate and the badness of the roads necessarily slow. The camp followers of an army there usually outnumber its fighting force. We have seen that forty days are required to march from Quatta to Herat, the distance being only 500 miles. By rail only that number of hours would be consumed. The railways by increased speed would be a large equivalent to great deficiencies in numbers, and armies at a distance from each other could give and receive reinforcements, as occasion required, without an enemy's knowledge.

But if railways are costly servants in times of peace, they are far more so in war. When held in possession by an enemy, they act like artillery captured on the fields of battle and turned against their former owners. To guard against such a disaster, a large patrolling force is required, strong enough at least, to drive off any raiding party sent to destroy them. The roads to be built in India, mainly for military and strategic value, in the near future will, no doubt, be provided with extra means for their defence and safety; these include iron bridges protected by forts, round-houses and car-sheds fortified, extra supplies of rails, the cars themselves to be bullet-proof, and very likely moving batteries mounted on trucks will be added. "Flying artillery" of this kind is not new; McClellan's army when investing Richmond had something of this sort. The sooner a complete system of such railways is inaugurated in India, the less damage she will sustain from a war with Russia. That nation if wise, would declare iron bridges, steel-rails and locomotives, contraband of war; for to them, more than to gatling-guns, breech-loading artillery, and Snider rifles, must England look for a successful termination of a struggle that will test her fortitude and courage to the utmost.

RAILWAY SANITATION AND CHOLERA.

BY S. S. HERRICK, M. D.,

SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE history of cholera since its appearance in Europe about the end of the first third of this century, justifies serious apprehension that the present year will not pass without its return to our shores. As nearly all are agreed upon its infectious nature and its portability, it behooves all who are engaged with the highways of travel to adopt such measures of precaution as the means at command render practicable; and none are more concerned than the railway companies of the country, particularly those operating lines running from the seaboard. Railway companies having well-organized medical departments are prepared to put in operation all necessary measures, and hardly need advice in these pages, but these are still much in the minority; hence a few words of counsel are both timely and appropriate.

Aside from the heavy weight of blame which would fall upon any railway management for being, through negligence, the means of spreading disease and death over the land, considerations of interest should be sufficient argument to exercise all practicable preventive measures towards an enemy so destructive to legitimate business. The only reasonable limit to such efforts would be the undefined line where restrictions become so offensive as to provoke clamorous resistance. Self-interest, therefore, demands supervision to prevent both the sickening of railway employés and their families, and the conveyance of contagion by merchandise, by passengers and by their personal effects.

It is so well settled now, that the infectious material of cholera resides in the discharges from the stomach and bowels, that means of control might be limited to thorough dealing with these. By this is meant their complete disinfection before they have had time to do harm. Of course, it is not supposed that any person known to be affected with the disease would be admitted to passage over a railway; but the suddenness of its onset renders an outburst quite possible upon a journey, with a strong concurrent prospect of scattering the disease-poison extensively along the track. It is easy to understand now how the disease may travel hundred of miles at a bound, and how one case may scatter the seeds along the route, to be followed in a few days by the unexpected outbreak of pestilence. Here we have a view of the most serious source of cholera—mischief, so far as railways are concerned—the ungarded water-closets of passenger-cars chiefly, and in less degree, those of the stations.

The contents of the latter can be dealt with so easily and simply, that this point may be dismissed very briefly. Probably the most efficient agent at our disposal, considering both energy and economy, is corrosive sublimate. One ounce of this chemical with an equal quantity of sal ammoniac, dissolved in a gallon of water, forms a cheap and potent disinfectant, the only objection to which is its danger if misused, by accident or design, for it is a deadly poison. One or two gallons used occasionally in a stationary privy or water-closet, when no danger is known to threaten, or one quart after every suspected evacuation, would be a reasonable precaution.

As to the water-closets of passenger-cars there would seem to be a serious difficulty, but this might easily be overcome by an important, but easy change in mode of construction. The suggestion of my friend, Dr. A. W. Perry, formerly of New Orleans, but now a member of the Board of Health at San Francisco, gives a simple solution to the problem. Instead of allowing the fecal matter to fall immediately on the ground, let the receptacle be somewhat englarged and the pipe at the bottom be closed by a valve, not controlled by the passenger, but by an intelligent train-attendant. Whenever cholera is known to exist anywhere in the country, this receptacle should never be discharged without thorough disinfection of its contents. The precaution should begin as soon as

cholera is known to have reached our coast, should be immediately adopted on all the lines of the country, and be continued until the complete disappearance of the disease.

Preparation for carrying out this simple measure should be made immediately, and, if begun without delay, passenger-cars throughout the country might probably be put in readiness, at very moderate expense, before the danger should actually reach us. But people are too apt to wait till the evil apprehended has actually appeared, and to act as if it were most likely not to come at all. To such, another reason might be given for prevention of a nuisance constantly committed by these open discharges from the water-closets of passenger-cars. The same simple contrivance will effectually obviate all offence of this kind. Such an outrage on public decency can not last much longer, and railway officials will soon wonder why they never thought of the remedy before.

Other precautions might be mentioned, having particular reference to choice of drinking-water for stations and for trains, but these are of general significance, without special reference to railway sanitation. The measure here recommended I regard as entirely practicable, and fully calculated to disarm the most threatening aspect of cholera in its relation to railway traffic.

PROMOTION IN RAILWAY SERVICE.

BY A SUPERINTENDENT.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN the April JOURNAL I discussed briefly the subject of passenger-train conductors, purely from a personal point of view, and did not speak *ex cathedra*. Far from being actuated to write from the strict official standpoint, I dwelt upon the theme with particular reference to the wishes and convenience of the traveling public in the selection of conductors and other train-hands in railway passenger service; and quite possibly I may be accused of disloyalty in overlooking the peculiar interests of the railway management. Since the appearance of the article in question, my attention has been called to a reply made in another railway publication, in which my position seems to have been misunderstood. The writer of this reply objects to my assumed antagonism to the promotion of baggagemen and brakemen to conductors, and erroneously supposes that I was talking from an official standpoint. In the first place, as before stated, I did not consider my brief article an official utterance; and, secondly, I am far from being opposed to the system of promotion. Promotion is an excellent thing, but I maintain it should *only be conferred for cause.*

We will assume that a railway adopts the system of promotion and announces to its train-hands that sooner or later, provided the employés in question remain in the service of the company, the successive positions from brakeman upward will be open to them. At first such an arrangement would seem beneficial, but while in actual practice such a system has been found satisfactory, it is bad to adopt it as a *theory*. Were such a theory to become an actuating principle of management of any road, there will at once be a certain class creation—the railway employé. Now are we benefitted by drawing a wide line of demarcation between the railway and the non-railway man? Do we gain anything by assuring the railway employé upon his connection with a road that certain advancement awaits him if he remains in its employ? To my mind there can be but one answer to these questions and that is No. Promotion in railway service should only be made for cause, which cause is a conspicuous attention to duty united with unusual capability. If the ordinary employé is given to understand that mere retention in service will insure promotion, his efforts will be directed to such mere retention only. If the system of promotion be a rigid one, and seniority of service be made the rule for filling vacancies in the upper ranks, where is the inducement for a younger employé to put forth extra exertion if he knows that a dozen or two dozen men, in every way his inferiors, stand between him and the promotion he covets? It may be said, and with some truth, that the system of steady promotion inculcates admirable discipline and that a road adopting it finds little difficulty in securing a good class of employés, but this discipline is secured at the expense of energy and zeal, and a wise modification of the system would give a still better class of employés and put every man upon the alert not only to perform his actual tasks, but to seek at every point to signalize his capacity by endeavors outside the beaten path of his duties. If promotion is made certain, depending only upon retention in service, we must also remember that retention in service depends merely upon negative excellence as shown in simple performance of duty. In the case of strict promotion, the official asks the employé "What have you done to *prevent* your promotion?" In the other case he asks "what have you done to *warrant* promotion?" These two questions show the difference between promoting railway employés for length of service, and promoting them for excellence of service.

It may be said that railway service can best be conducted on military principles and I have not the slightest objection to the practice of such principles, but the analogy should be carried out to the fullest extent. In times of peace promotion is made in the army through seniority of service, but in times of war such is not the course of procedure. Then the best man is pushed the quickest and conspicuous abilities are promptly recognized irrespective of length of service. Now in the case of railway employés they may be said to be in a constant state of war. They are perpetually in action and their capabilities are always being tested. Therefore, if military principles are to obtain let them be the military principles obtaining in actual warfare.

Furthermore, I am by no means sure that it is wise or politic for railways to assume that there are but two classes of people; those employed by railways and those not so employed. The infusion into railway service of a little outside blood, drawn from the counting-house, the manufactory and the field, is a good thing, if for no other purpose than to remind the employés that their positions are not held simply because they alone can fill them, but in view of meritorious service. As soon as you teach a man or let him believe that his services are indispensable, you destroy self-interest which is a powerful incentive to energy. If railway employés would rise they should be told to climb. Pushing them up is not the way to obtain the best results from their services.

For promotion in its proper sense, I have the highest

regard. The reward of meritorious service is the most powerful means of securing intelligent labor, and the railway which does not recognize the truth of this fact will never secure a desirable class of railway employés. But promotion simply on the ground of length of service, irrespective of the quality of this service other than it shall not be below the average, is a most pernicious course for any railway or other corporation to adopt, and it was this feature of railway "civil service reform" that I intended to criticise. If I have been misunderstood I would like to put myself correctly on the record. I thoroughly believe in promotion in railway service, but it should be a prize—not a pension.

BRIDGE LORE.

We can say that the building of bridges is cotemporaneous with that of road-making, at least the former has kept pace with the latter. Within the last twenty years many improvements have been made in the construction of bridges, but the type of the primitive bridge is yet to be seen in newly-settled localities. In the beginning the means of communication were over the surface of the ground, generally following such routes as would give the shortest distance between two points. It oftentimes happened that streams interfered, in which case, when they were small, they were readily forded, and if large, ferries were resorted to. But as the traffic increased something better was required, and then bridges either of timber or of stone were devised.

Undoubtedly the oldest construction was of stone built in the form of semi-circular arches, and which method was preferably employed in the crossing of deep and narrow ravines. In the crossing of rivers it was advisable to have as small a number of arches or spans as possible, and in order that the bridge might not be too high, segmental and elliptic arches were employed. Of course arches of this kind require much heavier abutments and piers to resist the thrust than circular ones, but on the other hand possess other advantages which more than counterbalance the objections.

The art of building stone bridges was known centuries ago. Herodotus mentions an extraordinary bridge constructed over the Euphrates by Queen Nitocris, the length of which was over half a mile. Darius, Xerxes, Cæsar and others built bridges for purposes of war, which were regarded as great works. Arched bridges were unknown to the ancient Egyptians and Indians. Even during the architectural glory of Athens there was no bridge across the Cephissus at that city.

The Chinese, however, were well versed in bridge building. The bridge at Foo-Chow-Foo has a world-wide reputation. China also possesses the longest bridge in the world. It is at Lang-ang, over an arm of the China Sea, and it is over four miles long, 70 feet high, with a roadway 70 feet wide, and has 300 arches. The parapet is a balustrade, and each of the pillars, which are 75 feet apart, supports a pedestal on which is placed a lion 21 feet long, made of one block of marble. Their bridges were generally built very solid, some with semi-circular, others with horseshoe-shaped arches. All the stones are wedge-shaped, the sides forming radii which converge toward the center of the curve. Suspension bridges were also unknown to the Chinese. Sangleong, the commander of the army under Kaowtsoo, who built the roads in the mountainous district of Shensa, conceived and accomplished the daring project of suspending a bridge from one mountain to another over a deep chasm. These bridges, which are called by the Chinese writers, very appropriately, flying bridges, are represented to be quite numerous, and are sometimes so high that they cannot be traversed without alarm. One still exists in Shensa, stretching 400 feet from mountain to mountain across a chasm over 500 feet deep.

One hundred and twenty-seven years B. C., Flavius Scipio built the Ponto Rotto across the Tiber, and of which there remained some years ago one span of 82 feet. The Emilius bridge across the Tiber at Rome was built 100 years B. C. It consisted of 7 arches or spans varying from 51 to 78 feet. The bridge built by Trajan about the year 120 A. D., had five arches each of 183 feet spanning the piers, which were over 64 feet thick. Some remains of the piers indicate the place where this colossal structure once stood.

Near the close of the eighth century Charlemagne ordered the construction over the Rhine of a bridge resting on 28 buttresses. The bridge was struck by lightning and burnt to the level of the water. German engineers are now removing the remains of the old structure on the Mayence side. They have already taken out a number of piles with lengths of 18 feet. The wood, which is nearly 1,100 years old, is so well preserved that it can still be used in building, the iron also being in good condition.

Other well-known structures were the bridges at Pavia over the Tessin, and at Florence over the Arno. The latter was built by Michael Angelo.

England can boast of some extraordinary bridges. The first bridge was built at Bow, near Stratford, in 1087. The first bridge across the Thames, at London, was begun in 1176. It consisted of nine arches of about 62 feet opening. The arches were of the gothic form, and the piers were unusually heavy and strong. The Westminster bridge, across the same river, built by La Belle, took 12 years for its construction, and at that time (1750) was the finest in the realm, and not surpassed by any in the world. The other London bridges are Blackfriars', Kew, the new London and the Waterloo bridge. The last named has nine arches with openings of 135 feet each.

Many stone bridges are to be found in France. The oldest are no doubt the bridges of Avignon (1187), Guillotiere (1245) and Saint Esprit (1285), across the Rhone. The Notre Dame bridge at Paris was built in 1412, and the Pont Neuf in the year 1604. Another well-known bridge over the Seine is the Neuilly bridge, built by Perronet in the years 1768–74. It consists of five arches, of about one hundred and twenty-nine feet openings each. The grandest stone arch in existence is the Cabin John arch, built by General M. C. Meigs, U. S. A. It has a span or opening of 220 feet, and carries the Washington aqueduct. The next in span is the Grosvenor bridge over the River Dee at Chester, England, whose single span is 200 feet. Another well-known stone bridge is the Nydeck bridge at Berne, Switzerland, consisting of three spans, of which the middle has an opening of 147 feet, the others being much smaller, namely, 53 feet each.

All of the bridges mentioned above are highway bridges, many of them having been built before the existence of railroads, or long before the building of railroads was even dreamed of.

There are very few stone railroad bridges having arches of considerable opening. Perhaps the largest in this country is the Falls bridge of the Philadelphia and Reading Railroad, which has a span of 78 feet. During the early construction of railroads in Europe, especially in Germany, a large number of viaducts were constructed, consisting of stone arches, but the span of the same was generally small, the average being from 30 to 50 feet.

The railroad bridge over the Neckar at Ladenburg, Germany, consists of seven segmental arches, each having an opening of 88½ feet. The bridge of the Stargard Posener Railroad over the Warthe river at Wronke has four spans of 75 feet each, and two additional spans at each end of 32 feet. The Franz-Joseph bridge, across the Etsch river at Verona, on the line of the railroad between Venice and Mailand, consists of five main spans, each having an opening of 95 feet.

Perhaps the largest stone arch of any railroad bridge is that of the Waldlitobel bridge on the line of the Arlberg Railway. This bridge crosses the valley of the Klosterle, about one and one-half miles from the Arlberg tunnel. At this point the railway passes over a ravine about one hundred and sixty-four feet deep, with sides rocky and very steep. The span of the main arch is 134½ feet, with a secured arch of 26¼ feet. Perhaps the longest span wooden bridge ever built was that constructed by Grubenmanan over the Limmat at Wittingen, Germany, which had a clear span of 390 feet. This bridge was erected in the year 1778. Prior to this time, in the year 1757, this same engineer built an extraordinary bridge at Shaffhausen, over the Rhine, which is there 400 feet wide. There was a pier in the middle of the river, but it is doubtful whether the bridge rested upon it. A man of the lightest weight felt the bridge vibrate under him, yet wagons heavily laden passed over it in safety. Both of these bridges were destroyed by the French in 1799. Still another long span bridge was that built in 1808, in Galicia, by the engineer Gross, which had a span of 324 feet. The Devil's bridge in the canton of Uri, Switzerland, was so called from its frightful situation so that it could scarcely be conceived how it was erected and many fabulous stories were invented to account for it.

In this country the Cascade bridge of the Erie Railroad was perhaps the longest span. The bridge consisted of two wooden arches, one placed above the other and both securely braced together. The arch at the springing line had a span of 275 feet, with a rise of 45. The rails were 185 feet above the bed of the stream. The first employment of iron for the purpose of bridge building was in the form of cast iron. The first attempt was made at Lyons, France, in 1775, but only one of the arches was made and first put together in the builder's yard. It was found that the cost would be too great, and the project was then abandoned.

The first iron bridge actually constructed was over the Severne at Coalbrookdale, England, in the years 1773–79. It was constructed after the designs of Mr. Pritchard, a Shrewsbury architect, and was on the whole a bold design well executed. But there was some defect in the abutments, which were forced inward by the pressure of the earth behind them, and the arch was partially fractured. Nevertheless the bridge proved serviceable and remains to this day. The span is 100 feet.

It is a curious circumstance that the next successful contriver of an iron bridge, and that of the boldest design, was no other than the celebrated, or rather notorious, Thomas Paine. In 1787, when a bridge over the Schuylkill at Philadelphia was proposed to be constructed without any river piers, as the stream was apt to be choked with ice in Spring freshets, Paine boldly offered to build an iron bridge with a single arch of 400 feet span. He afterward submitted the plan of his bridge to the Academy of Sciences at Paris, whose opinion was favorable, and he next proceeded to the Rotherdam Ironworks in Yorkshire to have his bridge cast. It was a segment of an arch 410 feet span and constructed of framed panels radiating toward the center in the form of voussoirs. An American named Whiteside having advanced him money, he was enabled to complete the castings of the bridge, which were then shipped to London and erected on Bowling Green at Paddington. Whiteside, however, becoming bankrupt, Paine did not succeed in finishing the bridge. The manufacturers then took it back as part of their debt and the materials were used in the construction of a bridge over the river Wear at Sunderland, which was erected in 1796. This bridge was long regarded as the greatest triumph of the art. Its span exceeded that of any existing stone arch, being 236 feet span, with a rise of 34 feet. The springing commenced at 95 feet above the bed of the river, and its height was such as to allow vessels of 300 tons burden to sail underneath without striking their masts. Iron bridges of smaller span continued to be successfully erected both in Great Britain and France, the Pont de Louvre (1803) and the Pont d'Austerlitz (1806), being well-known examples. Those, however, in London were soon thrown in the shade by the Vauxhall and the Southwark bridges. The latter consists of three arches, the center one being 240 feet span.

It will be observed that up to that time all the bridges constructed of cast iron were in the arched form, the same principle being followed as in stone. But during the same period in which the use of cast iron had been extending, wrought iron had also been introduced as the essential material in the construction of suspension bridges.

Sir Samuel Brown, greatly improved—he may be said to have invented—the iron suspension bridge, by introducing the system of the bar-link, now generally adopted. The Menai bridge constructed by Telford is a fine specimen of this kind of bridge. The main span is about 579 feet, and the height of the roadway is 100 feet above high water. The bridge was finished and opened for traffic on the 30th of January, 1826, having been five and one-half years in building.

Other suspension bridges are, one over the Danube at Buda-Pesth, the Charing Cross and Chelsea bridges over the Thames. The Buda-Pesth bridge was commenced in 1840 and by 1849 the work was pretty well advanced, when the Hungarian revolution broke out. Arrangements were made for blowing asunder the chains in event of the Hungarians attempting to force a passage, and 3,000 pounds of powder were deposited for that purpose. Buda having been successfully stormed upon by the

Hungarians, one of the last acts of the Austrian General Hentzi was to set fire to the powder on the bridge with his own hands, blowing himself and about 90 feet of the skeleton structure of the platform to atoms. When the war was ended, the bridge was finished, and the people of Buda-Pesth now proudly pronounce it the "eighth wonder of the world."

Passing to the subject of wire suspension bridges we must commence with the first large and perfect suspension bridge in the world, that of Freiburg, Switzerland, the shortest of the two suspension bridges connecting that city with its suburbs. The bridge built there later is longer, but the first one is remarkable for its extreme beauty. It connects the tops of two mountains, swinging over a dizzy chasm. No buttresses or mason work is visible at a little distance from the work; shafts are sunk in the solid rock of the mountains, down which the wires which sustain it are dropped. Viewed from a distance the bridge has the appearance of an immense spider's web stretched across the abyss, and supported merely by the rocky cliffs on either side. Being 300 feet high in the air its fine network of wire is scarcely visible against the sky. Passing vehicles and horses look like mere pigmies creeping over the slender highway. The largest of these bridges is supported by four wire cables each one containing 1,056 wires, the length of the clear span is 808 feet, its height 174 feet, and breadth 28 feet. This bridge was built during the years 1831-34.

The Wheeling suspension bridge was built in 1848, and has a span of 1,010.

Roebling's railroad bridge at Niagara has a span of 821 feet and a deflection of 59 feet, while its roadway is 250 feet above the level of the stream.

The suspension bridge at Cincinnati is 2,220 feet long, with a clear span of 1,057 feet, and is 103 feet above low water. The Brooklyn Bridge is 5,989 feet long, with a clear span of 1,595 feet over the East river. The Point bridge at Pittsburgh, which is a chain suspension bridge, has a total length of 1,245 feet from back to back anchorages, with one middle span of 800 feet between center of piers.

We now come to iron railroad bridges proper, in the construction of which the engineer has achieved his greatest triumphs, and exhibited higher skill and ingenuity than in any other branch of his Cyclopean science. The Britannia bridge across the Menai Straits is 103 feet above high water, and consists of four spans, two of 230 feet each and two of 459 feet. It is a wrought iron bridge, known technically as the tubular. The Victoria bridge across the St. Lawrence river near Montreal, is also a tubular bridge. It was commenced in 1854. It consists of 24 spans of 242 feet each, and a center span of 330 feet. The total length of the iron work, including the width of the piers, is 6,700 feet. There is also a long embankment at either end. The total cost of this bridge was $6,346,133. The center span of this bridge, namely, 330 feet, was at the time the longest span in existence in America, but since then many long span bridges have been built.

One of the grandest, most substantial and beautiful bridges is the St. Louis bridge, which was opened for traffic July 4, 1874. The bridge has three spans formed of ribbed arches made of chrome steel. The center span is 520 feet, and the other two 500 feet each.

The Henderson, Ky., bridge, across the Ohio river, has 16 spans, of which the channel span, 525 feet long, is the longest trussed span in the world.

The Ohio river bridge, of the Cincinnati Southern Railroad, has a channel span of 515 feet.

The Baltimore and Ohio Railroad bridge now building at Havre de Grace, Md., has spans of the following lengths: One 520 feet through, one 520 feet deck span, four 480 feet deck, two 380 feet deck, one 380 feet through, one 200 feet deck.

The largest iron bridge in the world was the ill-fated Tay bridge, whose total length was 10,321 feet. It consisted of 85 spans, of lengths varying from 27 to 245 feet.

But by far the most extraordinary bridge will be the Forth bridge, which is to consist of two spans of 1,700 feet each, two of 275, fifteen of 168 and five of 25 feet. The contract price for this bridge is $8,000,000.

The highest bridge in existence at the present day is the Garabit viaduct, situated on the railway connecting Marvejols with Neussargues, France. It crosses the deep valley of the Truyere, the height from the rail to surface of water being 406 feet. Its total length is 1,852 feet. The main span of this bridge consists of an iron arch of 541 feet span at the spring line with a rise of 170 feet. The bridge was finished April 26, 1884, and cost $620,000. —Emile Low in *Pittsburgh Dispatch*.

IMPROVEMEMTS IN TRAVELING.

THE adoption of a time-table on the New York Central route to the West, which lands the traveler in Chicago on Tuesday morning at the same hour of the day on which he left New York on Monday morning, marks a long step forward in the development of speed on American railroads. For two or three years the New York Central and the Pennsylvania Central have each run a special through fast train, known as the "Chicago Limited," which made the trip in shorter time than was ever before known. The Pennsylvania line recently knocked off an hour-and-a-half of the period previously allotted, and the New York Central has now followed suit. Hereafter, therefore, one has his choice between two trains, which start at 9 and 9:50 A. M., and promise to reach Chicago at the same hour the following morning.

From New York to Chicago by the Pennsylvania route is a distance of 912 miles; by the New York Central, 980 miles. Ostensibly these trains cover the distance in exactly 24 hours, as the hands on the clock should occupy the same position when the traveler reaches Chicago as when he left New York the previous morning. Really, the space of time is 25 hours, as the trains leave here by "Eastern time" and arrive in Chicago by "Central time," which is sixty minutes slower. The average speed by the Pennsylvania line is thus almost precisely 36½ miles per hour, while by the more Northern route it is 39⅕ miles. This latter speed is the highest ever attempted for a long distance in the United States, and is consequently an achievement which commands notice.

One only gets an adequate idea of the great progress which our railroads have made in the matter of speed during the last dozen or fifteen years by stumbling over some old travelers' guide, and comparing the time-tables then in vogue with the present schedules. Such a contrast is worth making for a few of the more important

routes. In 1870 the fastest train from New York to Philadelphia consumed 3 hours and 15 minutes, and even then left one in the outskirts of the town; in 1885, the ninety miles are covered in a couple of hours, and the traveler is landed in the heart of Philadelphia. Fifteen years ago the shortest time between New York and Boston was 8 hours and 20 minutes; now the trip is made in but 6 hours. In 1870 it took at the least 8 hours and 40 minutes to go from New York to Washington; 6 hours and 5 minutes now suffice. Fifteen years ago St. Louis was 46 hours from New York, and New Orleans 86 hours away; now it requires only 34 hours to reach St. Louis, and but 50 hours for the trip to New Orleans.

The comparisons are sufficient to illustrate the extent of the progress, which has been for the most part so gradual that its importance is not easily appreciated except by such a contrast. Improvements in road-bed, the abolition of grade crossings, and better rolling-stock have been the chief agencies in bringing about the change. The cutting down of time has been accompanied by other improvements, which add no less to the comfort of the traveler. The cars nowadays run much more smoothly than formerly, and the marked diminution in jolting is a very decided relief in a long journey. A better system of ballasting the tracks has made the plague of dust far less terrible, and something has been accomplished toward securing the admission of fresh air into a car without bringing in a cloud of smoke and cinders. The comfort with which a thousand miles can be traversed on such a train as the "Chicago Limited," with easily running parlor and sleeping-cars, and excellent meals served after a civilized fashion in a dining-car, was hardly dreamed of fifteen years ago. Even the railroad eating-house of hateful memory, at last shows signs of getting out of its old dyspeptic ruts. The experienced traveler reports each year a larger number of places where tolerable and even good meals are to be procured, while a few—alas! too few—railroad companies are also making this branch of their service worthy of high praise. Some enterprising companies are also building stations which, so far from being an offence to the eye, even have claim to beauty. Nothing could well be more depressing than the average depot of a generation ago; now there are at least a few lines on which the stations and the grounds about them are grateful to the weary traveler.

But, after all, a beginning only has yet been made. The fastest trains are yet too slow. It still takes much longer than it should to pass between New York and Boston. By the shortest route the distance is but 213 miles, and the time consumed ought to be nearer four hours than six—will be some day, we do not doubt. Almost as much should be said regarding the 228 miles between New York and Washington. Creditable as is the new schedule of the Western roads, twenty-four, or rather twenty-five, hours are still too many for a distance of less than a thousand miles. A man ought to be able to spend the whole forenoon, at least, in New York, and still reach Chicago by the opening of business hours the next morning. The highest rate of speed required to meet these demands would not equal that already reached by many trains in Great Britain. The Great Northern express from London to Manchester requires but four hours and fifteen minutes, although the distance is 203 miles, or nearly as great as that between New York and Boston; while the slowest expresses over this English road travel more rapidly that the quickest train to Boston. The fastest train between London and Glasgow covers the 440 miles in ten hours and twenty minutes, or at an average speed of 42½ miles per hour, a rate which if maintained between New York and Chicago would cut off between three and four hours from even the new schedule.

The fact is that the American public is just awakening to a sense of the improvements possible in traveling by rail. As time becomes constantly worth more money, the demand for faster trains will increase, while, as the rawness of national youth wears off, the utility of beauty in the accessories of travel will become more manifest. Encouraging as is the progress that has been made in the last fifteen years, it will be strange if the next fifteen years do not bring still greater changes. The traveler in 1900 will, doubless, look back upon his predecessor of 1885 with as much pity as the latter to-day bestows upon him of 1870.—*N. Y. Evening Post.*

THE ST. LOUIS TIME CONVENTION.

RECOMMENDATIONS OF THE COMMITTEE ON UNIFORM TELEGRAPH ORDERS AND GENERAL ORDERS.

STANDARD TIME.

No. 1.—Standard time should be furnished to all railway companies, in all parts of the country, at the same hour daily, without regard to the center from which it is disseminated. 12 o'clock, Eastern time, which is equivalent to 11 o'clock, Central time; 10 o'clock, Mountain time, and 9 o'clock, Pacific time, is recommended as the most desirable time for the signals to be sent.

No. 2.—All conductors, engineers, train-hands, road-foremen and others whose duties render it necessary for them to have correct time, should be required to provide themselves with time-pieces, the reliability of which shall be certified to in writing, by a competent watchmaker, stating the number of the watch; this certificate to be renewed every three months. Where not otherwise provided, the respective companies should furnish clocks at stations, and the agents, in all cases, should know that they show correct time.

No. 3.—All trainmen should compare time with standard clocks, which should be designated on the time-tables. They should regulate their watches thereby and register their names, and the time at which they register, in a book provided for that purpose, before leaving on each trip.

All employés whose duties prevent them from having access to these clocks should compare daily with, and regulate their watches by those of conductors and enginemen who have standard time and have registered their names as above provided.

CLASSIFICATION OF TRAINS.

No. 1.—All scheduled trains will have indefinite right of track over trains not scheduled, inferior class trains keeping out of the way of those of a superior class. The classification of all trains should be shown on time-table.

No. 2.—All trains run in one direction should have absolute right of track against others of same class running in the opposite direction, and it should be specified by rule, on time-tables, which trains shall have this absolute right of track.

No. 3.—As a very large percentage of the roads responding to this question use the right-hand track, it is recommended that on double-track roads all trains should keep to the right. Superior trains shall have right of road over inferior trains, as on single-track.

No. 4.—No recommendation. Covered by Nos. 5, 6, 7 and 8.

No. 5.—Passenger-trains running in the same direction must be kept apart not less than ten minutes, when between stations, unless some form of block-signal is used. Freight-trains should be kept apart five minutes.

No. 6.—Inferior trains should be required to be on siding and have switches set for main track, when running in the same directions, ten minutes before arriving time of superior class passenger-trains, and five minutes before arriving time of freight-trains of superior class. When running in opposite direction they should clear the time of departure of superior trains by the same interval of time.

No. 7.—Five minutes should be allowed for possible variation in watches, no portion of which should be made use of in running by either train.

No. 8.—When a train becomes twenty-four hours late it loses all right of road.

No. 9.—It can then only proceed under special orders. If detained at a non-telegraph station, it may require the last section of the first train of the *same class* passing in the same direction to flag it to the first open telegraph station.

No. 10.—Trains on the road when schedules are changed should assume time and rights of trains of the same numbers on new schedule, unless otherwise directed by special order.

No. 11.—Regular meeting or passing points should be shown on time-tables by printing the time in heavy or full-faced type, and where practicable, attention should be called by its number to the train met or passed.

No. 12.—In absence of special instructions, trains having right to road should hold main track at meeting points.

No. 13.—At meeting or passing points all trains should enter siding, head in, at nearest end. At spur sidings, where trains have to run by and back in, necessary precautions should be taken to secure safety.

No. 14.—It should be strictly the duty in all cases of all employés moving switches to replace them for the main line. Conductors, agents and foremen should be held responsible for this action on part of employés under their control.

No. 15.—At regular stopping places and at stations, when trains are of the same class, the responsibility for rear-end collisions should be placed upon the following train. In case of fog or storm, or if the view is obstructed, or the leading train has not absolute right to track, steps should also be taken to warn the following train of its position, but this will not relieve the following train of any responsibility.

FREIGHT-TRAIN REGULATIONS.

No. 1.—All sections of a train should have the same rights as the leading sections, and no more.

No. 2.—When a train falls back upon the time of another train of the same class, running in the same direction, the following train should be notified, either by special order, or otherwise, of the fact that the leading train is running on its time.

No. 3.—Superior class trains should not be allowed to flag inferior class trains under any circumstances, without special orders.

No. 4.—When extra or light engines are sent over a road on the time of passenger-trains, they should be sent ahead of and not allowed to follow such trains.

No. 5.—First-class trains should be required to keep ten minutes apart, and inferior class trains five minutes apart.

No. 6.—Station limits should be considered as between extreme switches, unless otherwise defined.

CONDUCTORS AND BRAKEMEN.

No. 1.—Flagmen and rear brakemen should be held responsible for flagging following trains. Conductors should be held responsible for seeing that this duty is properly performed. Engineers running light engines should also be held reponsible for the protection of their engines.

No. 2.—On roads with straight lines and light curves, torpedoes should be placed at a distance of not less than 3,600 feet in rear of train for cautionary signal, and 1,800 feet for stop-signal.

No. 3.—Except where State laws conflict, or crossings are provided with inter-locking switches, trains approaching a railway crossing at grade should stop at a distance of not less than two hundred feet, nor more than eight hundred feet from crossing.

Nos. 4 and 5.—Where the crossing is obscure, the conductor and engineer must both know that the crossing is clear and not likely to be obstructed before proceeding.

Where obscure crossings are not protected by target, the brakemen should precede the train to the crossing before the train is allowed to proceed, and the conductor and engineer should be held responsible for knowing that this service is performed.

No. 6.—Daily orders given work trains should include the hours between 4.30 A. M. and 8.30 P. M., unless otherwise specified in order.

No. 7.—The safety of trains running at high speed depending upon the equipment and physical condition of the road, we recommend that the speed of trains be regulated by the respective roads according to the requirements of their service.

No. 8.—We recommend that the letter "A" be used to indicate "train does not stop to receive or deliver passengers," and the letter "B" to indicate "train stops on signal," and that other letters of the alphabet be used for such purposes as the requirements of the respective roads may render necessary. We recommend further that no character be used to indicate how trains shall be run. It should be printed on the time-table, in connection with each train, whether it shall run daily; daily, except Sunday, etc.

No. 9.—Conductors should be held fully reponsible for the acts of their brakemen, and must know that they properly perform their duties.

No. 10.—Trainmen should be required to be on duty at least thirty minutes before the departure of their trains.

No. 11.—All trains should carry such signals as may be necessary to enable them to comply with the code in use on their respective roads.

No. 12.—All passenger-train men should be required to wear full uniforms.

No. 13.—The conductor or brakemen should announce distinctly from the centre of the car: "Next station is ——," immediately after the train leaves preceding station, and repeat the name of the station twice immediately before arrival at such station.

ENGINEERS AND FIREMEN.

No. 1.—Engineers and firemen should be subject to the orders of the officer in charge of the motive-power department, when on duty, and not on the road.

No. 2.—Engineers should register before leaving on each trip.

No. 3.—Engineers while on the road are solely under the direction of the conductor, except when such directions endanger the safety of the train, or conflict with rules, when they are held equally responsible with the conductor for any accident resulting therefrom.

No. 4.—Engineers should be held responsible for knowing that their engines are supplied with necessary tools, which tools should be specified by the regulations of each road.

No. 5.—Engineers should be held responsible for running off switches when the targets indicate that the switches are wrong, provided the targets are sufficiently large to be seen at such a distance as to enable them to stop.

No. 6.—At all terminal stations, and stations where the make-up of a train is changed, the engineer should be required to test air-brakes before starting, and should again test them after having run 1,000 feet.

No. 7.—Where signals are given and not fully understood by engineers, they must come to a full stop and ascertain positively what such signals indicate, before proceeding.

No. 8.—No fireman, not authorized by the proper officer, should be permitted to operate engines in the absence of the engineer.

SECTION FOREMEN.

No. 1.—Such instructions to section foremen as are necessary to the safe operation of the road should form part of general rules.

No. 2.—Section men should be required to make such temporary repairs to telegraph lines as are necessary, and report the same to the nearest telegraph station.

No. 3.—Section men should be required to protect themselves against irregular trains at all times.

YARD MEN.

No. 1.—In coupling cars, train and yard men should know that coupling apparatus is in proper condition and should take the necessary time to ascertain this fact.

No. 2.—Men should not be permitted to couple cars by hand, but should be required, in all cases, to use coupling-sticks, or some similar device that will not expose them to injury.

No. 3.—The use of liquor in any form, whether men are on duty or not, should not be tolerated.

No. 4.—Men dismissed, for cause, from one part of the service, should not be permitted to enter any of the other departments.

TRAIN ORDERS.

No. 1.—We recommend that the double order system should be used in all cases.

No. 2.—We would recommend the use of certain abbreviations in the movements of trains by telegraph, but, owing to our time being limited, have been unable to formulate them.

No. 3.—As a large majority of the roads favor writing all numbers in full, as well as using the numerals, we recommend that this be made the rule in all cases.

No. 4.—Train orders should be signed by some person designated by each company.

No. 5.—It is not necessary for regular scheduled trains to get telegraph orders authorizing them to run before starting from terminals.

No. 6.—Manifold paper should be used for train orders.

No. 7.—It is only necessary for the conductor to sign train orders received, but engineers should not leave stations where there are orders for their trains without having a copy in their possession.

No. 8.—In case the line fails before the order has been completed and made correct, the order should become void.

No. 9.—In running an inferior class train against one of a superior class, we recommend that, when it cannot be avoided, a holding order should be relied upon; but, if practicable, one telegraph station should intervene between the place where the order is given and the station where the other train is held.

No. 10.—Where the volume of business is sufficient to require it, train dispatchers should be allowed an assistant to copy orders.

No. 11.—In running one train ahead of another, we recommend that inferior trains running ahead of superior trains should be run on a time order. Trains of the same class should be run on positive orders.

No. 12.—We recommend that orders to run to any given point, regardless of another train, should be given only when absolutely necessary.

No. 13.—We recommend that the different forms of train orders allowed to be used should be published, with the general rules for the movement of trains, together with the explanations of each, on the time-tables.

Nos. 14 and 15.—All trains should stop for telegraph orders when the telegraph signal is displayed.

A train stopping for orders where signal is displayed should be given a clearance order, when there are no movement orders affecting that train.

No. 16.—We recommend the use of a time order to inferior trains, where circumstances require it.

No. 17.—We recommend that a time order should be given first-class trains to run late between specified points, for a distance not exceeding fifty miles, and to give all other trains the right to use the time to run against or ahead of such train.

Your committee have endeavored to embody in the foregoing recommendations all points that should be considered in connection with the general regulations; but if any important points have been omitted they should be glad to have their attention called to them.

We believe it to be the interest of all concerned that a committee should prepare and submit, at some future meeting of the Convention, a set of definite rules, based upon these recommendations, or such others as may be satisfactory to the majority of the roads.

We hope that the members of the Convention will fully express their views—*first*, whether they agree with the recommendations of the committee, as submitted in detail; and, *secondly*, whether they desire these recommendations to be formulated and presented for future action.

A Railway Museum.

As a means of showing the progress in railway appliances and for the preservation of relics of the old railway days, the New York Central and Hudson River Railroad Company has begun the formation of a miniature museum in the rooms attached to the railway branch of the New York Young Men's Christian Association, in the basement of the Grand Central station. The articles thus far contributed are but few in number, but they show in a remarkable way the giant strides made in machinery and equipment since the little engine made by Peter Cooper drew, in 1830, the first train over the then 18-mile road now known to the world as the Baltimore and Ohio.

The museum was recently described in the *New York Times*. Among the relics are the old driving-wheels of the "De Witt Clinton," the first locomotive built within the limits of the State, and the third constructed in America. The first trip of the engine was made on August 9th, 1831. The wheels, which now would not be recognized as a part of the locomotive, are apparently in as good order as when turned out of the West Albany shops, over fifty years ago. They are about 5 feet in diameter, but, unlike those now in use, are not solid, but built up from the hub like an ordinary wagon-wheel. The hub is solid, from which extend the spokes, 1 foot in diameter, welded to the felly and fastened by bolts to the hub. The felly is about 3 inches wide and ½ inch thick. The outer edge is dotted with holes through which the counter-sunk bolts passed, holding the steel flange, now replaced by a flanged tire. The wheels weigh only 350 pounds, as compared with 1,900 pounds, the weight of the driving-wheels, exclusive of the tires, now used on an ordinary engine.

In another corner of the room is a glass case containing a section of the old-style stringer, with a piece of the old strap-rails in general use till the T-rail was invented. The stringer and rail were laid on the Syracuse and Auburn Railroad in 1838. The rail is simply a flat bar 2½ inches wide and ⅞ inch thick. Alongside is strapped the old style of railway spike, looking not unlike a common tenpenny nail. Travelers of the olden time recall the frequent accidents of those days, when by the pounding of the trains on the flat bars the counter-sunk spike would fly out, with the result that the old "snake-head" rails, as they were termed, would fly through the bottoms of the cars, tearing and ripping through everything and frequently breaking the legs of the trustful passengers.

The museum also includes a specimen of the early time-tables of the Hudson River Railroad, when it terminated at Poughkeepsie. This shows that, despite the marvelous improvements in the engine and equipment, and the leveling, straightening and ballasting of the tracks, the old wood-burning locomotives managed to make about as good a rate of speed as their costly coal-burning successors. One of these time-tables, dated July 7th, 1851, gives the schedule time of trains running from the corner of Chambers and Hudson streets, whence they were drawn by horses to Thirty-second street and Tenth avenue, to Poughkeepsie, as 2 hours and 45 minutes. Similar trains, propelled by steam-power, from the Grand Central to the same station now take 2 hours and 14 minutes. It is intended to search through the old car-shops for any other relics that may now be stored away and bring them together, where they may find a permanent home and illustrate the gradual evolution of railway appliances and machinery from the primitive and crude properties in use at the beginning of railway building to the present perfected machinery now deemed essential on railways everywhere.

Must Have American Locomotives.

On the subject of American versus English machinery, Sir Julius Vogel, ex-Agent General for New Zealand, made a very interesting statement at Auckland, on February 17th. Sir Julius, who is now the colonial treasurer, spoke for several hours on the past, present and future of New Zealand, and in the course of his speech used the following language: "We sent home an order for certain locomotives after a type which we had running in the colony, and which were obtained from America. It was thought by the late government that it was unpatriotic to go to America for goods, so the plans and specifications were sent home to England, and the weights and sizes given most exactly. When these locomotives were about finished, the engineers telegraphed out that they were about to ship them, but that we had better order plant to strengthen our bridges and culverts, as it would not be safe to send the locomotives over them. Their idea was that we should make our railways to suit their engines. We telegraphed that we should do nothing of the kind; that we had limited the weight of the engines. They replied they could not be made according to the specifications we had supplied. But the answer to that was that we had them running in the colony, and we refused to take them. Well, this is what happened: We sent an order by telegraph to America for these engines, and such is the confidence we feel in the character of the material which will be supplied that we are prepared to take them without inspection there, whilst we cannot take the suspected ones from Great Britain." Sir Julius also made use of the following language: "I cannot help saying that under the Free Trade system of Great Britain there has been a great deal of scamped work and adulteration going on, and that buying in the cheapest market and

supplying as cheaply as possible, manufacturers have been in the habit of not conscientiously supplying the best articles. It is only quite recently that by a happy accident—an iron axle falling to the ground and breaking while being unshipped—we were saved from sending forth death and destruction on our railways by using rotten axles sent out from Great Britain."

The First Railway Ride.

It is fifty-three years since the first trial trip was taken on the Albany and Schenectady Railroad. The cars were coach-bodies from an Albany livery stable, mounted on trucks. The trucks were coupled with chains, leaving two or three feet slack, so that when the train started the passengers were "jerked from under their hats," and in stopping they were sent flying from their seats. The locomotive fuel was pitch-pine, and a dense volume of the blackest smoke floated toward the train. Those on top of the coaches had to raise their umbrellas, but in less than a mile the cloth was burned off, and the frames were thrown away. The passengers spent the rest of the time whipping each others' clothes to put out the fire, the sparks from which were as big as one's thumb nail.

Everybody had heard of the trip, and came thronging to the track as though a Presidential candidate was on exhibition. They drove as close as they could get to the railway, in order to secure a place to look at this new curiosity. The horses everywhere took fright, and the roads in the vicinity were strewn with the wrecks of vehicles.

At first the old stage custom of "booking" passengers (entering their names) prevailed, but it fell into disuse. One list reads: "Boy, Lady, Stranger, Friend, Whiskers."

A Boston paper said a railway to that city would be as useless as one to the moon. A member of the Massachusetts Legislature opposed it, on the ground that nobody ever heard of such a thing, and it would be improper to take people's land for a project that no one knew anything about.

When Locomotive Engineers are Tempted to Drink.

As a class, railway engineers in active service are exceptionally temperate men. According to the *Medical and Surgical Reporter*, the daily performance of their duty requires a clear brain and steady nerve, which is very soon broken up by any use of alcohol. The nerve tension to which they are subjected in active work produces after a time many and profound nerve disorders. One of the hints of breaking down in this class is excessive caution and timidity. Often men who have had an accident and escaped without any external injury will soon exhibit signs of mental shock, in what is called loss of nerve or childish caution. Their trains will always be late, they will "slow down" and slacken speed from no reason except some internal fears, and have to be changed to other work. Insomnia and dyspepsia are also common signs of exhaustion. After the day's run they will be unable to sleep or properly digest food, and alcohol in some form will be found to give relief. This will soon verge into inebriety, and the drinking will be confined to the hours after the work is over. During the day they drink nothing, except perhaps beer, and that in great moderation; but when night comes they use spirits to excess again. After a time such men will show marks of failure in excessive caution or recklessness, and be very irregular in their management of the engine. They will have heated journals and broken engines beyond the average experience.

These and many other indications soon render them unfit for the work. It is the opinion of a competent authority than an engineer who begins to drink will be, as a rule, obliged to give up work in two years from general incompetency, although his use of spirits may be at home and largely concealed, and what is called general moderation. A fact has recently come to notice with its explanation that is of unusual interest. On a through line running out from New York it has been observed that nearly all the engineers who were changed and discharged for drinking were on the night trains, and were considered the most competent. The conclusion was that men on these night runs were more likely to drink, and the individual opinions of railway managers agree on this point.

English and American Railway Speed.

It is interesting, remarks the *Railway News*, to note the tendency of English railways as compared with American railways to increase the speed and the number of their express trains. Eight years ago the number of trains between New York and Philadelphia was considerably less than half what it is now, and the aveiage rate of speed has probably been increased from ten to twenty per cent. In England there has been an increase in the average rate of speed on nearly all the roads, and an increase of the average on all. On the Great Western, although there has been no increase in speed, the average has increased about four and a half miles an hour. On the Great Eastern the increase in speed has been seven and five-sixths miles, and in case of only one train making fifty-one and a quarter miles an hour there are now twenty-four which average fifty-six and three-quarters. On the Midland the number of expresses have been doubled, and the average rate of speed is four miles an hour greater. The tendency there as well as here, is toward heavier and more numerous express trains and a disposition to increase the average rather than the highest speed, though it is well known that our local accommodation-trains run at a higher rate of speed (omitting stops) than the express-trains which run long distances without stopping.

Low Railway Bridges.

Judge Churchill, of Boston, in his decision in the inquest concerning the death of William W. Lord, a brakeman on the Eastern Railroad, who was knocked from the top of a car on March 13th by coming in contact with a bridge near Revere, after reviewing the circumstances, says: "His death adds another to the list of deaths caused by leaving a narrow space of only a few feet between the top of freight-cars on railroads and bridges constructed overhead, obliging railroad employés to be constantly on the alert to protect themselves by lying flat

or crouching down upon the roof of cars where their duty calls them. This is likely to be a frequent source of the loss of valuable life in the future as it has been in the past. Death may be said to have resulted in this case from a faulty system of bridge construction, coupled with the lack of such a degree of vigilance as men seldom possess."

Railways for China.

A WASHINGTON special to the St. Louis *Globe-Democrat* says: "The Chinese minister is very busy conducting negogiations of the greatest importance with a syndicate of New York capitalists. His government is considering a proposition to construct a complete system of railways to spread over the empire. The Russian government, it is stated, is in accord with the project, and will extend the system of that country so as to form a connection with this proposed system of China. The project is the grandest of modern times. It contemplates an expenditure of $190,000,000. From the instructions received at the legation here, it seems that the Chinese government looks to the United States for the manufacturing interests to furnish all the materials, and the energy and scientific skill to take charge of the construction. What is desired is an organization of American capitalists to take the whole job off the hands of the government for a round sum of money. The minister is instructed to see if responsible Americans will grapple with this great undertaking. If so, the Chinese government will submit just what is wanted, and the Americans will send out engineers and skilled railroad builders to make estimates of the cost, the time required, and to furnish other information. The Chinese minister, or rather the *chargé d'affaires*, has been in New York for several days in consultation with capitalists there upon this project. This is a great step for China to take, but the Celestials seem very much in earnest."

An Old Locomotive.

RUNNING on the little branch road from the Pennsylvania at Edgewood station up to the mines of the Hampton Coal Company, above Wilkinsburg, is, according to a local paper, probably the oldest engine now in use in the country. Up to within three or four years "Old Hannah," as she is called, was in active use on the main line of the road. For over a quarter of a century the old engine passed and repassed, hundreds of times, to and fro between Pittsburgh and Philadelphia.

"Old Hannah" was built at the Baldwin Locomotive Works in 1851, and was the first of its kind ever built in this country. The number on her front is No. 1. In her day, before the great improvements on locomotives were brought out, she was considered a wonderful engine, and she was, too. Strong, well built, and with powers of great speed, "Old Hannah" had matters pretty much her own way on her road. As she was the oldest, the other locomotives kind of laid back out of the way when she came dashing along. They showed her great respect. But it was during the stirring times of the war that "Old Hannah" made for herself her great reputation. Tom Lacock, the engineer now in charge of the old veteran, is well acquainted with her history. "During the war," he said recently, "'Old Hannah' tugged more soldiers through to Philadelphia than any two engines on the road. She was specially on this line of duty. I knew her engineer, and I think he was prouder of his engine than any man I ever knew. For twenty-nine years he held the lever on 'Old Hannah,' and she never got ugly, or refused to do work. She was a model in her behavior. I never heard of her wrecking a train or smashing up anything."

French State Railways.

FRANCE does not appear to have prospered very much in her State railway experiment. At the close of 1883, there were 1,397½ miles in operation upon the old network, and 3,89⅜ miles in operation upon the new network, making an aggregate of 1,786⅞ miles. The average length of line worked in 1883 upon the old network was 1,379⅜ miles, and upon the new network 356⅞ miles; making a total for the year of 1,736¼ miles. The traffic receipts in 1882 were 1,066,218*l*., while the working expenses of the year were 963,744*l*., leaving a surplus of 102,474*l*. The old network was worked at a profit last year, while the new network was worked at a loss. Even upon the old network, however, the ratio of the working expenses to the traffic receipts was as high as 84 per cent.

South Australian Railways.

THE second reading of a bill to authorize the construction of a railway from Port Augusta to Phillip's Ponds, a distance of 111 miles on the 3-ft. 6-in. gage, at a cost of 278,000*l*., was passed by the South Australian House of Assembly, but the bill was rejected on the third reading. A bill to authorize the construction of a line from Petersburg to Silverton on the New South Wales border, a distance of 155 miles, has been agreed to by the Assembly and has been sent on to the Legislative Council. The line is estimated to cost 540,000*l*.

IT appears from the report of the directors of the Great Central Belgian Railway of 1884, that 6,348 tons of rails were used for maintenance purposes last year. Of the rails thus used 3,581 tons were steel rails; 992 tons new iron rails; 48 tons steel rails reëmployed, and 1,725 tons iron rails reëmployed. The average price of the steel rails used last year was £5 12s. 9d. per ton; and that of the iron rails, £5 1s. 2d. per ton. In the course of last year 6,040 tons of rails were withdrawn from service.

THE Northeastern Railway, of England, is laying down three-quarters of a mile of iron railway-ties to test their durability and adaptibility to the work. The iron ties are nine feet long, the same as the wooden ones, are nine inches wide, and weigh about 225 pounds each. They are fitted with a cushioned steel chair for holding the rail, and it is riveted to the tie.

THE New York commissioners of railways propose to examine and test, through competent engineers, each of the 3,500 wood or iron railway-bridges in the State. New York is the first State to adopt this plan suggested in 1875 by the American Society of Civil Engineers.

American Railroad Journal.

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Principal Contents of this Number.

CONTRIBUTIONS.

(Written for the American Railroad Journal.)

EDITORIALS.

MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

NEW INVENTIONS.

SPECULATIVE RAILWAY CONSTRUCTION.

THE present increase in railway receiverships indicates the cheerful fact that the year 1885 will probably be recorded as the year marked by the heaviest era of railway insolvency the country has ever known. The first three months of the year have seen twenty additional railways placed in the hands of receivers, the capital stock of the corporations aggregating $275,289,000. According to the *Railway Age*, the first quarter of 1885 shows more than one-half as many roads, more than thirty-seven per cent. of the mileage and about forty per cent. of total capital stock represented, involved in bankruptcy as did the entire year of 1884.

This is a good beginning. And yet railway construction will continue with but little abated vigor. It is an easy way of explaining this era of railway insolvency by attributing it to the general depression of the times, but such an explanation is by no means satisfactory; the depression of the times may have some effect upon the railway interests as it has upon every business interest of the country, but the steady increase of railway receiverships must be otherwise accounted for.

Railway construction is more or less speculative under any conditions, and the investors run more or less risk of receiving but small returns from their investments. So it is in every enterprise. But there is one feature of railway construction and investment that is peculiarly its own. Though a road may pass into the hands of a receiver almost the very moment it is put into active operation, as in the case of the West Shore, for instance, though the stockholders may receive no dividends for many years, though at its inception it may be run at a considerable yearly loss, nevertheless, a railway is built to stay, and eventually, even though in the very distant future, it will make money, and it is this forecast of the future that begets a wonderful confidence in the ultimate returns from railway investment. Mathematically speaking, this way of looking at the question is false. Capital invested for a dozen years should legitimately be expected to yield twice the return of capital invested which immediately draws interest, and if twenty or thirty years must pass before a road is expected to declare dividends, the mathematical interest to be realized is quadrupled. To the ordinary observer there are many roads whose stockholders are receiving enormous dividends, yet if the truth were sifted it will be found that the stockholders would have been better repaid for the capital invested had they placed it in some conservative business or property yielding but a moderate return, but yielding it at once. Deferred returns should be very generous in amount to compensate for their "subsequency" so to speak, but strange to say this very simple fact is frequently forgotten in the matter of railway investment.

Another fact that is overlooked is the novelty of railway investment. It is less than sixty years since the first railway was constructed in this country, and while the present generation look at them as a matter of course, and act as if railways and civilization had always gone hand in hand, railway construction is in its infancy from a financial point of view. They are constructed in a speculative spirit; to "open up" new industries and territories, to build a patronage if none exists, and to compete with other profitable lines, oblivious to the fact that what is ample for one is not always enough for two or three. We have not lived long enough in a railway atmosphere to become good financial weather prophets, and railway investment is often pure guess-work. It is quite possible that our grandchildren may see a million miles of railway in the country, and yet we, with our one hundred and twenty thousand miles, are apt to think that railway industry has reached the zenith of its power. When the questions of railway investment and construction have been mellowed by the experience of a century their speculative character will be modified, but the interval will be one of countless insolvencies and receiverships.

But there is no cause for alarm, and no fear that railway progress will receive other than a wholesome check. The capital now tied up in non-profitable railways comes almost wholly from those who can afford to wait for returns. Ultimately there will be a profit and a railway receivership is by no means a disaster. As a rule a road is not injured by a little recuperative attention paid it under the watchful eye of the courts, and it comes out of its judicial guardianship in a more healthy shape. Despite the unpromising aspect of railways as money-making investments during the present year, there is no safer investment for a capitalist to make—if he is prepared to wait for returns, even though the greater portion of his waiting period be passed underground, and the era of harvest realized only by his posterity.

ENOUGH!

WE cry "hold! enough!" Our assorted stock of patience is exhausted, and we warn our very genial contemporary who has been courting the muse and casting disrepect upon the venerable locks of the JOURNAL, that terrible reprisals will follow his reckless disregard of the weight of our vengeance. The poor, humble little item which appeared in these columns and aroused the wrathful genius of our brother of the pen, did not merit the harsh treatment it received, and our embarrassment is great upon reflecting that not a line of the JOURNAL escapes the gaze of the railway poet, eager for an opportunity to swoop like a hawk upon some trifling paragraph, and wreathing about it some ghastly verses, bestow the creation of his disordered intellect upon an unsuspecting public. Still, we perceive, through the scarcasm of the laureate of the rail, a fund of inexhaustible humor, and like Hamlet, slightly perverted, we can exclaim:

"We know a hawk from a *Grimshaw*."

THE FIELD OF THE RAILWAY INVENTOR.

AN examination of the weekly *Patent Office Gazette* shows a surprisingly large percentage of inventions applicable either directly or indirectly to railway use. In the matter of car-couplings and nut-locks alone, over a dozen such devices are weekly recorded, and yet the link-and-pin-coupler is still in use, and the ordinary nut and bolt are generally employed as rail-fastenings. Spark-arresters there are without number; brakes, railway-signals, car-trucks, and a miscellaneous assortment of devices of more or less merit supplying every real or supposed requirement in railway appliances; yet but a comparatively small percentage of them meet with general adoption and the inventor is apt to regard the railway as a poor field for the exercise of his inventive genious. In this he is wrong, and in seeking for the cause of the non-adoption of his device, he must first look to the poverty of the device itself; and, secondly, to the bungling manner in which he has endeavored to bring it to the attention of railway officials.

The JOURNAL makes it a point to examine every railway device patented, and describes monthly a number of the most meritorious. While all the meritorious inventions are not described, owing to the unwillingness of many inventors to publish their inventions before they have studied and improved upon them, those described form a goodly proportion of those possessing merit, and of the total number of railway inventions they do not equal five per cent. If descriptions were made of all railway patents sent us for publication, the JOURNAL would act unfairly to the inventors whose devices really possess merit and cumber its pages with worthless reading matter.

Now assuming that ten per cent. of railway inventions really possess merit, which is a liberal assumption, it is evident that ninety per cent. are, while perhaps not worthless, devoid of special merit and betray poverty of invention. In this latter class there are about one hundred and fifty inventions every month, and the one hundred and fifty inventors each think they have opened a sure road of fortune. The railway officials in every department are overrun by these sanguine individuals, and, as a rule, the more apparent the worthlessness of the device, the more importunate the inventor in his demands for a "trial" forgetting, apparently, that a trial is often a most inconvenient and expensive undertaking. Naturally the small percentage of inventors whose devices are really ingeni-

ous, novel and meritorious, are sadly hampered in their endeavors to bring their inventions to the notice of the proper railway authorities, and discouragement and a general belief in the inutility of railway inventions ensues. This is a great mistake. It may be confidently stated that of all industries railways are the most alert to avail themselves of new and improved devices, and by them merit is quickly recognized. Only it is essential that the inventors should go about matters in the right way, which, as a rule, they are far from doing.

In the first place, the average invention, even though it be a meritorious one, is crude. The idea may be a good one, but the application is but half-studied, and the inventor's first effort is directed to securing a patent. Having obtained that precious document which insures him from the encroachment of others upon the fruits of his genius he is apt to regard his work as finished and look to the railways for further action. Procuring a patent is all right enough, but there is no great haste for obtaining such security. The idea or actuating principle of an invention is but a small part of it. The elaboration of its application, its simplification and improvement are, or should be, the results of months of study, and no invention should be submitted for inspection until every part and detail has undergone a severe and sharp criticism. It will not answer for an inventor to seek for the good points of his invention, but for its weak points. Neither should his investigation and study be directed to making everything *new* about the device. Well-known and reliable methods of application enhance the value of an invention, and the closer the device to the prevailing methods the greater its chance of adoption, provided the devices at present used meet with reasonable satisfaction. Improvement and not novelty, is what the inventor should seek for. Too often railway inventions resemble a certain book of which a critic wrote that there was " much that was both new and good in the work ; but that which was new was not good, and that which was good was not new."

The field for railway inventors is a great one, and the opportunities are numerous and striking for the exercise of inventive skill, but railway officials care little about patents in themselves, which is a truth not often comprehended by the patentees. A patented device is of no more value in a railway official's eyes than one unpatented ; what they desire, and what they are always ready to examine, is an improved device for accomplishing a definite purpose. Furthermore, they do not wish to be compelled to invent a device over again by suggesting an indefinite number of improvements that could be made. Naturally they object to their time being taken up in the examination of crude, ill-digested inventions, generally the production of persons little familiar with practical railway problems, nor do they wish to endorse even meritorious inventions with flaming characters, when there has been little or no practical test made as to their permanent usefulness.

Last, and most important, it must be remembered that there is no such thing as the *profession* of invention. An invention is a species of inspiration, and no living man can grind out inventions one after the other like so many clothes-pins. When an inventor has struck what he considers a "good thing," let him stick to it and spend his time in its improvement and elaboration. He can hardly expect to strike another immediately, and yet too often his first success is but the forerunner of a dozen failures. The invention of one successful device has a dangerous tendency to render the inventor visionary, and who can wonder at the small percentage of really meritorious inventions, in the face of a statement made to the writer not many days since by an enthusiastic gentleman, that the latter was the inventor of *sixty-five patented devices ;* none of which had met with practical adoption, yet all of which were for sale at fabulous prices !

EDITORIAL NOTES.

AT last after years of waiting the Bartholdi Statue has reached our shores, and for the completion of the Pedestal Fund the public must once more thank the generosity and enterprise of the press. Single-handed and almost alone, ridiculed, and with discouragement at every step, the *New York World* set about the undertaking of raising the last $100,000 necessary to complete the Fund, and at the present moment it can truthfully be said that the amount is complete, the few remaining thousands being virtually assured. In its treatment of the spontaneous gift of the French people it cannot be said that America has behaved generously and well, that is, if by America is meant the rich men of the country ; but the appeal made for the first time and at the eleventh hour to the industrial classes met with noble response, and the erection of the statue is a tribute to the energy of the American people. Scarcely a single trade or industry is without representation in the fund collected by the *World*, and the thousands of donors are for the most part unknown and humble toilers. But the strange part of it all is that Wall street—Wall street the pure, the generous, the patriotic, the bulwark of national prosperity—has been strangely silent to the appeal for funds, but then the denizens of that crooked financial alley are presumably too well-bred to care for such a vulgar thing as Liberty.

* * *

THE new postal regulations to go into effect on July 1st, are highly praiseworthy, both on the ground of economy, and also on account of their common-sense utility. The abolition of the half-ounce limit for single postage is a wise step, and needless trouble is saved thereby. The

amount of time and labor consumed to weigh letters suspiciously near the old limit, was not paid for by the excess charged; and the increase of the limit to one ounce is a great improvement. It is rare that an ordinary letter weighs over one ounce, and greater expedition can be secured under the new system. But the most practical novelty introduced in our postal service is the special rate of ten cents, for which a special stamp is to be furnished, whereby a letter so stamped is to be treated as a special missive, and immediately forwarded to its destination and delivered, thus in great part taking the place of telegraphic messages. This special delivery is to be furnished to and between all cities of 4,000 inhabitants and upwards, and we shall be surprised if it does not prove a popular branch of the postal service.

* * *

NOW that the admission of the Baltimore and Ohio within the sacred precints of the Quaker City is all but accomplished, attention is directed to its further outlet to New ɪork. It is highly probable that the Jersey Central will be deemed the most available route, and if the former should absorb the latter in its system, a lively rivalry will ensue between the Baltimore and Ohio and the Pennsylvania. Until lately the Pennsylvania has had the whip hand, but there is seemingly a chance that its omnipotence will receive a slight check.

* * *

ANOTHER reduction in through fares has taken place and the public sit expectant waiting for still another. It really does seem as if the upshot of it will be that free transportation will be reached, and possibly if the public wait long enough they will receive premiums for traveling. One fact is indisputable and that is that improvement in railway facilities seems to be steadily followed by a cheapening of rates, and there is every indication that this inverse relation will be maintained.

* * *

ELSEWHERE we print in full the recommendations of the committee at the recent St. Louis Time Convention. Their enumeration has reference to the questions propounded to the various roads, and the conclusions reached indicate the judgment of the members as to the best answers to such queries. An interesting study is afforded in examining these results, and the recommendations may be taken as an earnest of what the Convention may hereafter accomplish.

* * *

THE establishment of a railway museum, as noticed elsewhere, is a step worthy of comment, but it would be better had its promotors endeavored to furnish something a little better than an old curiosity shop. The combination of the museum with a railway inventors' institute, showing by accurate models the complete growth of the railway industry, would have been a more useful undertaking, nor would it have been so difficult to accomplish. The history of railways is comprised within the limits of the past sixty years, and no great amount of research would have been necessary to furnish the necessary models.

* * *

THE unsquelchable KEELY is again distracting public attention by tests of his motor, and cultivating the wool-crop flourishing over the eyes of his stockholders. His latest explanation of the "force" which he generates sounds for all the world like the ravings of a lunatic, and yet the stockholders have voted a series of resolutions expressing belief in his ultimate success. Truly the gullability of people is astounding, but not quite so astounding as the ineffable cheek of Mr. KEELY.

"THE Official Railway List for 1885," published by the Railway Purchasing Agent Co., of Chicago, is received, and is invaluable. In addition to the tabulated list of railways with their officers and heads of departments, the work is also furnished with an index of the cities and towns in the United States and Canada, in which there are general railway offices and shops, as well as an alphabetical list of all railway officials whose names are in the body of the book. All changes in railway management during the past year have been carefully chronicled, and the list has fully earned its sub-title of a "Handbook of Uuseful Information for Railway Men."

"DWELLINGS for Village and Country, with General Descriptions and Estimates," is the attractive title of an attractive book compiled and published by Mr. S. B. Reed, at 245 Broadway, New York, the author of "House Plans for Everybody," "Cottage Houses," etc. The work is handsomely gotten up, and contains descriptions of thirty-five different dwellings, with full plans and estimates, together with one hundred and forty-nine illustrations. Mr. Reed has added another valuable contribution to his architectural series, and the book in question forms an admirable companion to his previous works.

A RECENT issue of the JOURNAL announced the early publication by McCorquodale & Co., of London, of Mr. E. B. Ivatts' "Railway Management at Stations," and the book has since been received. While distinctly an English work there is much in it to recommend it to American railway men, and a perusal will amply repay readers on this side of the Atlantic.

A TIMELY publication is a musical composition entitled, "Liberty Enlightening the World," published at Hitchcock's music store in this city. It is a bright and stirring song and chorus, the music by Fred. A. Rothstein and the words by George Cooper. We understand that the proceeds of the sale of the work are to be devoted to the Pedestal Fund.

THE *Railway Reporter* is an ever-welcome visitor, and we note with pleasure its improved form and general typographical appearance. The *Reporter* has removed its headquarters from Pittsburgh to Philadelphia, though retaining a branch office in the former city.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.
First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.
Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.
Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.
Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.
The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

A UNITY OF INTERESTS.

THE recent successful opening of the Brooklyn elevated road, and the agitation of the Broadway Arcade Railway scheme in the New York Legislature, bring us face to face with the fact that for long-distance urban transit the surface road does not entirely meet the public want. Both of these enterprises at first languished, as indeed did the construction of elevated roads in this city; but scarce a month now passes that we are not informed of the organization of some corporation in our larger cities to afford increased facilities for rapid transit.

In many instances such schemes meet with bitter opposition from surface roads, and not wholly without reason when the contemplated roads are to be brought into direct opposition with existing surface roads, but even if we are to assume that in a few years all the large cities will be furnished with elevated or underground roads that will render their competition with horse-power roads an irretrievable injury to the latter, still, there are fields of operation for the latter that can not be injured by the operation of the former, and are even greatly benefitted thereby. It will be many years before the operation of elevated and underground roads becomes general, and at best it will be confined to the large cities; so even from the pessimistic view of the street-railway manager but a small percentage of American street-railways will be injured. But even in large cities the shrewd investor in street-railways will perceive in the construction of elevated roads a new field for the construction of surface roads.

The elevated or underground road aims at directness, and its line is laid out with a view to reaching a definite point in the least possible time. In cities such as New York, whose width is contracted and whose length is in abnormal proportions thereto, the elevated road can only run in one direction, and of necessity there must be numerous portions of the city which they cannot reach directly. It is in these short trips from the stations of the elevated roads to outlying streets and districts that surface roads can be operated with profit, and the greater the travel upon the former, the greater the travel also upon the latter. In New York City since the opening of its four lines of elevated roads there has been a marked increase in the number of short cross-town roads, which cross the elevated structures at streets where the latter have stations, and while the longer surface roads extending in parallel directions to the elevated roads may have suffered by the latters' construction, the cross-town roads have been great gainers.

At the same time, for short distances where the passenger is in no particular haste, the surface road will always secure almost the entire traffic, even if an elevated road runs directly over it; while in bad weather it can serve as a feeder to the latter, even while in direct competition with it.

Under the circumstances it would seem unwise for surface roads to display unwarranted hostility to the construction of elevated or underground railways, when their advent is certain, and when, at the same time, they can be made a positive source of profit to the surface roads. To a great extent there is a unity of interests between the two classes of roads, and the sooner it is recognized the sooner will it conduce to the prosperity of both.

THE Broadway surface road is completed and the passers-by now hear for the first time the merry jingle of the car-bell on that time-honored thoroughfare, while the cumbrous omnibus has taken its departure. It will be some time before the vexed question as to the advantages and disadvantages of the road will be settled, but the public can afford to wait with perfect satisfaction. For if, as predicted, Broadway will become hopelessly blocked, it follows that the road cannot be successfully operated, and, therefore, must be abandoned; while, *vice versa*, if it is a success, the thoroughfare will not be incommoded. There will now, at any rate, be a wholesome lull in anti-street-railway warfare for some time to come, since Governor HILL has vetoed the Arcade Railway Bill, and for this lull let us be thankful.

* * *

A BILL has passed the New York Legislature and been signed by the Governor, incorporating the American Street-Railway Mutual Insurance Company. Elsewhere in this department we print the bill in full, and in chronicling the event we receive fresh proof of the lasting benefit to street-railways resulting from the establishment of the American Street-Railway Association, and kindred organizations. The saving to the street-railway companies effected by the incorporation of the insurance company will be considerable, and insurance will, hereafter, be furnished practically at cost, instead of the street-railways payinge xorbitant rates as formerly.

THE UPHOLSTERING AND INTERIOR DECORATION OF STREET-CARS.

BY A CAR-BUILDER.

[Written for the AMERICAN RAILROAD JOURNAL.]

PREVIOUS issues of the JOURNAL have contained an interesting series of articles on the painting of street-cars, and the author of the series, signing himself "A Veteran," showed a familiarity with the subject. Equally important from an artistic standpoint, is the subject of the upholstering and interior decorations of these carriages for the million. Great advances have of late been made in the direction of street-car furnishing, and the impulse which art in general has received in recent years has not been without its due effect on street-car decorations; but the subject is ever a fruitful one and may be discussed to the profit of the street-railway company and the pleasure and comfort of its patrons.

Primarily the chief object sought in upholstering street-cars is durability and cleanliness. The old-fashioned cushions formerly employed on the car-seats have given place to handsome lattice benches, these latter being often covered with some soft and durable fabric. Such an innovation is a great improvement. The cushions were unserviceable, became torn and slovenly after short usage, and afforded excellent facilities for the breeding of vermin. While at first they were comfortable, a few weeks' use gave them the consistency of hard brick, and as articles of comfort they ceased to possess any virtues.

Another feature of former car-fittings—not so "former" as could be wished, however—was the hemp matting upon the car floor. No more disagreeable covering for the car floors could have been selected. Not only did the matting or floor-cloth become ragged and untidy after short use, but also unspeakably filthy after a few weeks' service. Infinitely preferable is a plain bare floor, although there is no necessity for jumping from one extreme to the other. The wooden floorings in the form of lattice slats offer an admirable substitute for matting in that they are readily removed and cleaned, and act as a flooring and matting combined. Mud and dirt do not adhere to them while at the same time the floor of the car is kept free from dirt even in the worst weather, by the particles dropping between the slats. Just at present the medical fraternity and the public press are exercised on the subject, and clamor loudly for the abrogation of the matting, especially on the cars of the elevated roads. It is claimed, and with great show of truth, that these hemp mattings are breeders of disease, and poison the atmosphere of the cars.

It must be borne in mind that street-cars in Summer require less upholstering in the way of floor and seat covering than in Winter, where such fittings are supposed to impart warmth, but even in Winter it is better to suffer with the cold to some extent, than to acquire a slight warmth through the medium of soiled matting and vermin-infested cushions. The time is doubtless coming when the heating of street-cars will be a generally accomplished fact, but until it does, better a cold car than a dirty car, and no matter what attention is given to cleaning it, no street-car can remain clean with thick cloth cushions and matting.

In regard to the decoration of street-cars it may be laid down as a fact that the simpler it is the better. Street-cars are essentially vehicles for use and, therefore, the decoration should be of an unobtrusive character. Formerly it was the aim of car-decorators to expend their time and ingenuity in painting hideous landscapes upon the panels over the windows, but this relic of a barbarous age has pretty well gone out, and nowadays one sees either simple wooden panels or—owing to thriftiness on the part of the roads—a series of advertising cards inserted under the roof of the car. While advertising cards are not strictly artistic, they are far more in keeping with the general surroundings than the gorgeous panel paintings formerly in vogue, and even in the arrangement of the advertisements considerable artistic skill can be exercised.

As far as possible paint should be avoided in the interior of streets-cars, natural woods which are more serviceable and easier kept clean being substituted. If possible, it would also seem well to do away with the blinds generally used on the windows, which require the passengers to rise and adjust them to suit themselves. Perhaps it would not be feasible to employ the rolling curtains now coming into use on railway-cars, owing to their liability to injury from too frequent handling, but there would be a ready adoption of some simple device by which the amount of light entering the car-windows could be adjusted, without putting the passengers to the trouble now generally experienced.

It is difficult to treat of the decoration of street-cars and railway-cars from the same standpoint, for the two vehicles are widely different. In the first place, the railway-car is generally employed for journeys of considerable length and there is not the same constant change of occupants taking place as in the street-car. Therefore there is not the same wear and tear in the interior fittings and decorations. Again it must be considered that passengers enter a street-car directly from the streets, carrying with them all the mud and dirt adhering to their shoes, while with a railway-car intermediate buildings are first traversed and the major part of the dirt left behind. It is a far simpler matter to design a form of decoration and upholstery for a railway-car than for a street-car where the conditions are so much more unfavorable, and in the humbler conveyance luxury is not aimed at. Cleanliness and comfort are the two essentials in street-cars, and to these simple ends all efforts of upholstery and decoration should be directed.

THE LIABILITY OF STREET-RAILWAY COMPANIES FOR NEGLIGENCE.

BY O. S. BRUMBACK.

[A Paper read before the Convention of the Ohio State Tramway Association.]

(Concluded.)

II. LIABILITY OF STREET-RAILWAYS TO THEIR EMPLOYÉS FOR WANT OF CARE.

THE question of the liability of street-railways to employés for want of care, we will likewise consider under two sub-divisions: *a*, Liability for injury caused by defective machinery, and *b*, Liability for injury caused by the negligence of fellow-servants.

a. LIABILITY FOR INJURIES CAUSED BY DEFECTIVE MACHINERY.

The liability of street-railway companies to their servants for negligence is the same as in other cases where the relation of master and servant exists; and chief among the duties of a master toward his servant is to furnish safe and sufficient machinery. The court in a case[27] expressed the Ohio doctrine on this subject when they say, in effect, that while a railroad company is not to be treated as a guarantor of the sufficiency and safety of the cars and machinery, yet it is liable for any damage to an employé, where the injury is without fault on his part, and is the result of the neglect of ordinary and reasonable diligence in furnishing safe and sufficient cars or machinery. An employé, although he undertakes his engagement in view of the nature, hazard and responsibilities of his employment, yet has a right to expect *reasonable care and diligence* on the part of his employer in furnishing him with safe and sufficient cars and machinery.

Observe here the plaintiff must himself be without fault, and must make it appear that the company have not exercised reasonable care in providing safe machinery. If the defect was not known to the company, and could not by reasonable diligence have been known, the company is not liable.[28] If the defect is known to the employé, and he continues to work without complaint, he will be held guilty of contributory negligence.[29] But where, as in a late case, he makes complaint of the defect to a foreman and is directed to continue his work, and, in so doing is injured, it becomes a question for the jury whether he is guilty of contributory negligence under all the facts in the case.[30] But the defect must be known to the employé in its true light, *i. e.*, as dangerous to himself, to influence his case.[31] While the company must use reasonable care in procuring good and safe machinery, and ordinary care to keep it so, yet if it becomes defective, or remains so by the neglect of a fellow-servant, the company is not liable.[32] And this brings us to the other branch of the question.

b. LIABILITY FOR INJURIES TO ONE EMPLOYÉ CAUSED BY THE NEGLIGENCE OF FELLOW-SERVANTS.

The general rule in this class of cases, may be said to be that the master must answer for injuries to subordinate servants caused by the neglect of a superior in authority over them.[33] But a master is not liable for injuries resulting from the negligence of a fellow-servant, *i. e.*, one acting under the same master, and assisting in carrying out a common object, unless—note the qualification—unless the master did not exercise reasonable care in selecting servants competent for the duty in hand.[34] Judge Ranney explains, in effect, the reasons of the rule.[35] He says: "Each servant takes upon himself the hazard of the negligence of his fellow, and public policy requires they should be interested in exercising supervision over each other. But the agent or officer intrusted with power and control over the subordinates, is not engaged in a common service with them, but exercises the control of the master, who is under obligations to do it with care and skill." The line of demarcation between a superior and subordinate servant is often so difficult to trace, that the books are full of cases determining who are fellow-servants and who are superior servants. And the decisions are ofttimes arbitrary, the judges themselves dissenting.[36]

Upon the whole, it may be said that each particular case depends principally upon what the evidence may disclose was the duty and relative authority delegated to the injured and injurer. "It is immaterial"—says the last-named case, citing Pennsylvania Supreme Court—"it is immaterial, whether he who causes and he who sustains the injury are or are not engaged in the same or similar labor, or in positions of equal grade or authority; if they are acting under one master in carrying out a common object, they are fellow-servants."[37] As, for example, a railroad company is held liable to an engineer for the negligence of the conductor, the last-named being a superior officer;[38] so to a brakeman.[39] Where a track repairer and a fireman on an engine are held to be fellow-servants, one cannot recover for the negligence of the other.[40] So a laborer on a gravel train and the engineer are fellow-servants;[41] so, too, a brakeman and an engineer;[42] a foreman of a set of hands making repairs is a superior servant, and the company must answer to the hands for his negligence.[43] The doctrine of the master's liability is carried still farther,[44] and it is held that if an injury is sustained while carrying out a dangerous order of a superior, the company is liable, even though the injury is partly caused by the negligence of a fellow-servant. And so we might go on with further illustrations, but enough have been given to show the principle involved, and any man of intelligence can apply it to most of the individual cases that arise.

The question of the amount of damages properly recoverable in these cases is *apropos* to our subject. Judge McIlvaine[45] states the rule on the subject, where he says: "It is true the law does not profess to compensate for remote and possible injuries resulting from the act of a wrong-doer, but it does profess to make the injured party whole by compensating him in damages for all the natural, necessary and probable injuries resulting therefrom. . . . . This brings us to the inevitable conclusion that injuries to the person, whether they consist of mental or physical pain, as well as loss of time or property, which naturally and necessarily result from the wrongful act of the defendant, are proper subjects for the jury in their estimate of compensatory damages;" but the ability of the plaintiff as a "bread-winner" may also be taken into consideration by the jury in estimating the damages, as habits of drunkenness.[46] Physicians' fees may be properly included.[47] Where death results to the injured party, pecuniary injury to his representatives is alone to be considered; no account can be taken of the bereavement or mental suffering caused by such death.[48] Where the injury is malicious and within the scope of the agent's employment, the company may be liable for exemplary damages, *i. e.*, damages by way of punishment.[49]

In general, we may conclude, the plaintiff can recover in a case of negligence, what he can show is his direct pecuniary loss—past and prospective—resulting from his injury, as well as (where he survives) the injuries to his feelings, mental or physical suffering, together with what may be allowed as a punishment for malicious conduct.

We have now completed our short survey of a very extensive subject.

In conclusion, I may add that observation and experience all go to show that a railroad company, while ever ready to combat a *blackmailer*, should yet ever be ready to do justice in meritorious cases, without the expensive luxury of a law-suit. The principles given will enable any of you to readily see your position in a case of negligence; if doubtful or questionable, and you can settle with a claimant for a fair compensation of his injury, that course is by all means the best; but if your case is one in which a compromise will only encourage others to pursue you, or one in which the demands are grossly unreasonable, take a stand upon your rights, and, once in the fight, "see to it that your opponent gets the worst of it." Remember, good testimony is the trump suit in the game, and you cannot secure for yourself too much or too early. Don't weaken down or give up at any half-way station, but "stay. in" and bring every resource into play. I have seen many a poor case won by a determined front, and favorable compromises effected by prolonged resistance. Keep up your courage; if your position is a fair one and your rights in jeopardy, the higher courts will do justice to a corporation; and a jury's manifest injustice is often the very means of securing the final victory.

27. 5 Ohio St. 541.
28. 5 Ohio St. 541.
29. 33 Ohio St. 468.
30. 40 Ohio St. 148; 31 Id. 479.
31. 1 Cleveland Rep. 314.
32. 12 Ohio St. 475.
33. 31 Ohio St. 287. and cases there cited.
34. 33 Ohio St. 150.
35. 3 Ohio St. 202.
36. 17 Ohio St. 198.
37. 17 Ohio St. 210; 11 Id. 417.
38. 20 Ohio St. 415.
39. 3 Ohio St. 202.
40. 8 Ohio St. 249.
41. 33 Ohio St. 150.
42. 33 Ohio St., 196; 37 Id. 665.
43. 36 Ohio St. 221.
44. 37 Ohio St. 549.
45. 23 Ohio St. 18.
46. 19 Ohio St. 151.
47. 24 Ohio St. 329.
48. 28 Ohio St. 191.
49. Sedg. on Dam. 35; 19 Ohio St. 157.

THE AMERICAN STREET-RAILWAY MUTUAL INSURANCE COMPANY.

A BILL has been passed by the New York Legislature and signed by the Governor, incorporating the American Street-Railway Mutual Insurance Company. The following are the provisions of the act of incorporation:

SECTION 1. The following persons named in this section and their successors namely, William White, Charles J. Harrah, James W. Foshay, Calvin A. Richards, William H. Hazzard, D. F. Longstreet, William Richardson, Alexander H. Davis, Charles Cleminshaw, Samuel Little, G. Hilton Scribner, Thomas Lowry, Henry M. Watson, John B. Parsons and William J. Richardson are hereby constituted a body corporate by the corporate name of the American Street-Railway Mutual Insurance Company, and shall possess the usual powers and be subject to the usual duties of fire insurance corporations in the State of New York, and its principal place of business shall be at the City of New York, in the County and State of New York.

SECTION 2. The corporation hereby created shall have power to insure against loss and damage by fire, buildings, shops, depots, cars, machinery, fixtures, furniture, equipment, live-stock and property of all kinds and description owned, leased or used by surface street-railway companies in the United States and Canada, and the said corporation may issue its policies to such companies, and such companies are authorized to receive the same, agreeing to pay all loss or damage that may be sustained by fire upon any such property, by the holders of such policies, not exceeding the sum named in the policy. The premiums upon all policies issued shall be paid in cash.

SECTION 3. The above-named persons shall be the first directors of said corporation. Their respective terms of office shall be determined by lot, so that five shall hold office for one year, five for two years and five for three years, respectively, from the first Tuesday in June, eighteen hundred and eighty-five. After the expiration of such terms of office, respectively, the succeding terms shall be for three years from such expiration. Directors to fill vacancies occurring by the expiration of the term of office shall be chosen at the general meeting of the corporation, which shall be held on the first Tuesday of June in each year, and continued by adjournment or otherwise until such vacancies are filled. Directors to fill vacancies occurring before the expiration of the term of office shall be chosen by the board of directors to hold office for the unexpired portion of the term; and directors shall continue to hold their respective offices after the expiration of their terms until their successors shall have been duly chosen and qualified. Directors shall be officers of surface street-railway companies.

SECTION 4. The president, vice-president, secretary and treasurer, and all other officers, shall be chosen by the board of directors, and shall hold office during the pleasure of the board. Their duties and compensation shall be such as shall be fixed by the board.

SECTION 5. Before the treasurer shall enter upon the duties of his office, he shall execute and deliver to the directors a bond, with sufficient sureties to be approved by such directors, conditioned for the faithful performance of his duties as such treasurer.

SECTION 6. This corporation may purchase or rent such real estate as may be required for the convenient transaction of its business, and may otherwise invest its funds in such manner and in such securities as fire insurance companies are authorized to invest in, by chapter four hundred and sixty-six of the laws of eighteen hundred fifty-three, entitled "An act to provide for the incorporation of fire insurance companies, and the acts amendatory thereof and supplementary thereto." All investments of the funds of the corporation shall be in the corporate name, and only upon the approval of the board of directors.

SECTION 7. Every surface street-railway company insured by this corporation shall be a member thereof. At each general meeting of this corporation, a full statement of its affairs shall be submitted, verified by the oaths of the president, and secretary and treasurer.

SECTION 8. The board of directors of this corporation shall have power to make such by-laws, not inconsistent with this act, and the constitution and laws of the State of New York, as may be deemed nccessary for the holding of meetings of the corporation, and its board of directors; the government of its officers, and the conduct of its affairs; and the same, when necessary, to alter and amend, and adopt a corporate seal, and to change and alter the same at their pleasure.

SECTION 9. Policies may be issued by this corporation when the superintendent of the insurance department shall have ascertained and certified that the capital hereinafter required of this corporation has been paid in, and is possessed by it in money or in such stocks, and bonds and mortgages as are required by the eighth section of said chapter four hundred and sixty-six of the laws of eighteen hundred and fifty-three, and the acts amendatory thereof and supplementary thereto.

SECTION 10. When the just claims for losses and expenses unpaid against this company shall exceed the funds in the hands of the treasurer, over and above the cash capital hereinafter mentioned, and the unearned premiums on outstanding policies. its directors may assess such sums as may be necessary to pay all claims and keep such capital intact, upon the members holding policies, in proportion to the premiums paid by each; such assessment not to exceed the amount of the note hereinafter mentioned, and to be paid within thirty days after notice thereof shall have been received by any such member. To secure the prompt payment of such assessments, the directors shall receive from each member a note for not more than twice the amount of the current annual premiums paid by such member. Such note shall constitute all the liability of the member, and may be enforced to the extent of the amount with interest from the date of any and every assessment made thereon and remaining unpaid thirty days after notice thereof shall have been reached by any such member.

SECTION 11. The directors may, from time to time, at a general meeting or special meeting provide in what manner and to what extent members shall participate in the profits of the company.

SECTION 12. The corporation, as an additional security to its members, over and above their cash premiums, and the notes hereinbefore mentioned, shall unite as cash capital, which shall be at least five hundred thousand dollars, and may be increased, from time to time, to an amount not exceeding two million dollars, to be divided into shares of one hundred dollars each to such members of this corporation as shall subscribe and pay for the same; and such members, being surface street-railway companies, are hereby authorized to subscribe and pay for said shares to such amount as its directors may determine, which shall be transferable on the books of the company, but to members only, subject to such regulations as the directors shall from time to time prescribe. Only holders of cash capital paid in shall be entitled to vote, and such holders shall be entitled at all meetings of said company to one vote for each share of said stock held by them, respectively, such votes to be given by an officer, or proxy duly authorized. The directors may allow such rate of interest on its cash capital and such participation in profits as they may from time to time determine, in accordance with the laws of the State regulating the payments of dividends by corporations, and such cash capital shall be liable as the capital stock of the corporation in payment of its debts; provided, however, that if said capital should become impaired to the extent of twenty per cent. of the amount fully paid, it shall be the duty of the superintendent of the insurance department to issue a requisition, on the stockholders for the payment of the deficiency; and all proceedings thereunder shall be the same as are now fixed and determined by law for the

payment of deficiencies by requisition of the said superintendent on joint-stock fire insurance companies of this State.

SECTION 13. Within ten days after notice of a loss has been received, a committee of not less than three directors shall determine the liability of the corporation on said loss, and if such determination shall not be satisfactory, or in case any difference of opinion shall arise as to the rights of parties under any policy, the subject thereof shall be referred to three disinterested men as referees, the directors and the insured each choosing one of the three referees, and the two so chosen selecting a third, and the decision of a majority of said referees shall be final and binding upon the parties, and any amount determined to be due by the corporation shall be paid within thirty days after such decision has been certified by the referees, or a majority of them, to the corporation.

SECTION 14. Any member of the corporation may withdraw therefrom by giving a written notice of such withdrawal to either of the officers at the office of the company, and upon such member paying all assessments theretofore or thereafter made upon it for losses and expenses which have been incurred before the receipt of such notice, any note or notes given by such member to secure the payment of assessments in the manner hereinbefore provided shall be relinquished and given up, and membership shall thereupon cease; and upon such cessation of membership, the member shall be entitled to the usual short rate return premium, and shall be exempt from all further liabilities and forfeit all further benefits from said corporation, except such liabilities and benefits as may arise from continued ownership of any of the capital stock thereof.

SECTION 15. Nothing in this act contained shall be construed to relieve or exempt said corporation from making statements and reports to the insurance department; or as releasing from the payment of such taxes and fees as are now or hereafter may be required from fire insurance companies, organized under the general insurance laws of this State.

SECTION 16. All acts and parts of acts inconsistent with this act are hereby repealed.

SECTION 17. This act shall take effect immediately.

The Broadway Surface Road.

THE surface road upon Broadway, New York City, is now completed and cars are regularly run thereon. Work was commenced on May 23d, and has been pushed with remarkable speed, and with as little interruption to traffic as could have been expected. The construction of the road was in charge of William Wharton, Jr. & Co., of Philadelphia, contractors, and the work has been performed in a creditable manner. The west track was first laid commencing between Thirteenth and Fourteenth streets, just below Union square, and as fast as the track was laid the street was repaved. Upon the completion of the west track the east track was laid in the opposite direction.

The road runs from Union square to Bowling Green. Ultimately the track will be completed as far as the Battery, but for the present, stages will communicate between the Battery and the southern terminus of the road At Union square the road connects with the Broadway and Seventh Avenue road, and cars are now run on the line to Central Park. Temporary cars of the University place road are now used, but new cars will soon be put upon the tracks and these are promised to be the handsomest street-cars in the city. As soon as the road commenced operation the omnibuses were taken off Broadway. Seventy-five cars are run on one minute-and-a-half headway, and the round-trip is scheduled at one hour and forty minutes.

It is charged that the iron rail used in the road is not the "grooved rail" promised under oath before the commissioners. The latter, according to diagrams shown, had a groove one-third of the distance from the edge, to receive the flange of the wheel. It is intimated by the management of the road that the improved rail will be received from Europe in course of time.

The company pays the city an annual rental of $40,000 a year, keeps the pavement to the width of twenty feet in repair, keeps this space entirely free of ice and snow in the Winter, and pays the city 3 per cent. of the gross receipts for the first three years, and 5 per cent. thereafter The fare for the whole line is limited to five cents. The travel upon the road is great at present, but until its novelty is worn off, it will be impossible to judge of its success or of its effect upon the traffic of Broadway.

Electric Elevated Railway in Chicago.

THE Chicago and Cook County Railway Company is proposing an electric elevated railway, on State street, from Adams to Sixty-third streets, and along Forty-third street from State street to the Stock Yards branch, about one and one-half miles additional.

As the laws of the State require the consent of a majority of the land owners abutting on the proposed line of track, petitions have been prepared and placed in the office of the secretary, and interested parties are asked to sign these early, in order that the road may be in readiness for business by next Winter, the company pledging itself to commence work at once when these preliminaries have been completed. The company also pledges itself to pay landowners from Adams to Twenty-second streets—about two miles—$10 per foot for right of way; from there to Forty-first street and to the Stock Yards, $5 per foot; and on State street from there to Sixty-third street, $2 per foot. Further pledges bind the company to use only electricity as a motive power, and to warm their cars during cold weather.

The New Road in St. Louis.

SOME uneasiness has been caused in St. Louis, Mo., among the residants along the route of the proposed Northern Central street-railway line, from fear that the franchise was simply secured to prevent other parties getting hold of it. Mr. Julius S. Walsh, the president, who is largely interested in the Citizens and Union lines, portions of both of which will be utilized by the new road; announces that he intends to break ground within the next sixty days.

Proposals for the work have already been sent in, and the road is expected to be in operation by the opening of the Fair.

Electric Cars for Street-Railways.

MR. A. RECKENZAUM has recently brought out a new and improved car in England. It has two motors of about nine horse-power, weighing 420 lbs., each of which is carried on a small truck, one axle of which is a driving-axle so that four wheels are actuated by the machinery. The speed of the motor is 1,000 revolutions per minute, with the car running at 7 miles per hour, and a reducing gear is employed consisting of a worm on each motor-shaft and a worm-wheel on the driving-axles, giving a ratio of 1 to 12. The variation of speed and power is obtained by means of a compound switch, which arranges the motor-circuits so that the machines shall work in

series, parallel or singly; the power and speed varying with the resistance of the circuit; while for greater range of speed the motor-circuits are still further divided by arranging the field magnet wires apart from the armatures, thus obviating cumbersome gearing. Mechanical and electrical brake-power is employed. The coal required for charging the batteries is four pounds per horse-power.

A Legal Decision.

Eminent Domain — Street-Railway.—The construction and operation of a horse-railway on the public streets of a city by authority from the government, is not such new or additional burden imposed upon the land as will entitle the owner of the fee to compensation therefor, or that it would amount to such taking or damage as would require a condemnation of the right of way. Streets are acquired, established and maintained for the accommodation and convenience of the inhabitants of the city and the general public, and however acquired, whether by purchase, condemnation or prescription, it is that they may be used for the public convenience, by the ordinary and usual modes of conveyance operated upon such streets, chief among which is the street-railway. With us, city authorities have the power to consent that the streets of the city may be used to a reasonable extent by street-railway lines. Street-railways are included among the usual modes of conveyance along the streets of a city, and although in some respects inconvenient, this must be acquiesced in by all parties in the interest of the general public. The duties of the railroad company and the public at railroad crossings are reciprocal, and the right of each is restricted by public necessity and convenience.—[Texas and Pacific Railroad Company *vs.* Rosedale Street-Railway Company, Texas Supreme Court.

The Proposed Railway on Mail Street.

THE General Term of the New York Supreme Court, Judges Davis and Brady, has granted the application of the Bleecker Street and Fulton Ferry Railway Company for the appointment of commissioners to take testimony and report to the Court whether that company shall have the privilege of constructing a branch of its road through Mail street, from Park Row to Broadway, in order to connect with the tracks of the Broadway Surface Railroad Company. The Court has appointed as Commissioners, Frederick R. Coudert, Jesse Seligman and Edward La Montague.

A New Cross-Town Road in New York City.

THE Fulton and Cortlandt Street Railroad Company, Otto S. Wise, secretary and treasurer, recently sent to the Board of Aldermen a petition for consent to construct a street-railway over the following route: Beginning at the Cortlandt street ferry, in West street, and running thence through Cortlandt street, Maiden lane, Water street, Burling slip, and South street to Fulton Ferry. Returning through South to John street, to Broadway, to Dey, to West street, to the starting point. The petition, together with a resolution fixing June 24th as the time when the advocates and opponents will be heard, was referred to the Railroad Committee.

An Improved Rail for Street-Railways.

A NOVEL description of track is being laid in St. Louis, Mo. The steel rail has a 5-inch upper surface of the usual make, and a wide base, giving a section very similar to ordinary railway iron. The weight is 56 lbs. per yard, and the length 30 feet. The joints are made with fish-plates and bolts, and the rails rest on steel chairs 5 inches high, spiked to white oak ties, placed 6 feet apart.

The Only International Street-Railway.

EL PASO, Texas, has the only international street-railway in the world. From El Paso to Paso del Norte, Mexico, the fare is ten cents, and going to the latter place the conductor will take none but American money, but returning he will accept Mexican coin.

STREET-RAILWAY NOTES.

THE Macon (Ga.) Street-Railway has been completed. Macon had a street-railway once before. The line crawled up the steepest streets in the city, and never paid its owners a revenue of any importance. A passenger who was injured in getting off one of the cars brought suit to recover damages, succeeded, and wrecked the road.

THE North Chicago City Railway Company have promised to extend their track from Graceland to the high-school, provided it is rebuilt on its present site. It is also said that they will extend their track on Lincoln avenue at Belmont avenue as soon as Lincoln avenue is macadamized.

THE Orange Belt Railroad from Longwood to Myrtle Lake, Fla., is completed. Steam-power will not be used as the road is too short, but horses or mules will be employed. The road is being extended to Paola, which it will soon reach.

THE engineer of the Tenth avenue cable-railway in New York City says cars will be running by July 4th. The road extends down 125th street to Tenth avenue, and down Tenth avenue to 186th street.

CONTRACTOR GORE, of Boston, commenced laying the rails for the Onset Bay street-railway on May 25th, a cargo of iron having arrived from New York.

EXPERIMENTAL runs were made with the cable-cars in Philadelphia, on June 11th, and proved satisfactory.

THERE is but one street-railway in Manitoba, the Winnipeg Street-Railway, of Winnipeg.

TOKIO, Japan, is now furnished with a street-railway which is meeting with great favor.

A NEW street-railway is to be built in St. Louis to be known as the Northern Central.

THE rails for the street-car line at Pierre, Dakota, have arrived and will soon be laid.

THREE new street-railways have recently been completed in Los Angeles, Cal.

WORKMEN are tearing up Atlantic avenue, Brooklyn, for the new cable-road.

THE construction of the street-railway in Rome, Ga., is in progress.

A NEW street-railway has been built in Canton, O.

New Inventions.

Rote's Automatic Brake.

Charles V. Rote, of Lancaster, Pa., is the inventor of an improved automatic brake for railway-cars, which is herewith illustrated and described. This brake comprises two mechanisms, entirely automatic in their action. The first is the brake-setting or actuating mechanism proper, for applying the brakes; and the second automatically

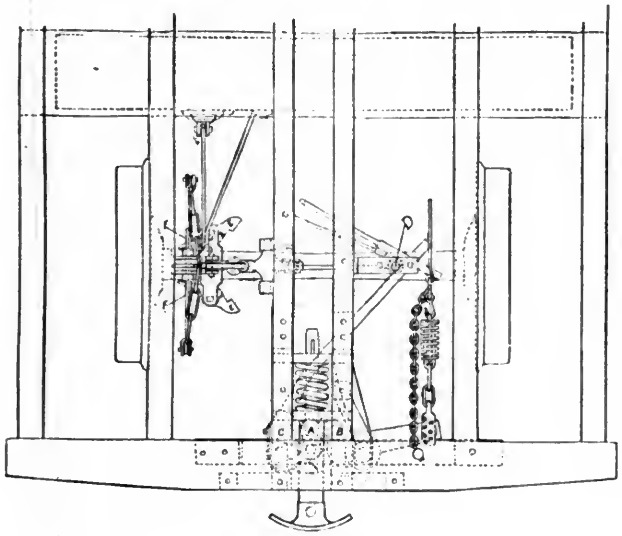


Fig. 1.

ROTE'S AUTOMATIC BRAKE.

locks and releases the brake-actuating mechanism, rendering it operative or inoperative as occasion requires. The first is in connection with the draw-bar and the frame or bottom timbers of the car, and the second is in part in combination with the bottom timbers and in part with an axle and its truck, the adjustment of these parts being such that the turning of the truck in turning curves does not in the least impair or affect their proper action.

In the accompanying cuts, Fig. 1 is a top plan view of the brake showing the connecting mechanism; Fig. 2, a front view; Fig. 3, a side view, and Fig. 4, a front view of a car with the brake attached.

The brake-setting or actuating mechanism is exceedingly simple, comprising only three parts. These are an adjustable block or dog A, pivoted on the lower face of the draw-bar, a brake-lever B, having its inner short arm projected within the path of the block or dog when the latter is held in operative position, and a cam-lever C, for adjusting or holding the dog in operative position to act on the brake-lever, or permitting it to move to one side and pass by the brake-lever without actuating it.

The mechanism whereby the brake-actuating mechanism is automatically locked in operative position, or released and rendered inoperative, as occasion may require, is ingenious and very simple. It consists of a gravity-stop or pin D, for locking the cam-lever in operative position, and means for automatically raising and withdrawing the gravity-stop, thus releasing the cam-lever and rendering the brake-actuating mechanism inoperative. This is effected by the employment of knuckle-jointed, self-locking and self-releasing levers E E E E, on the axle, rotating with it, and controlled by the speed of movement of the car.

When the car is moving slowly in either direction, as each of these jointed self-locking and releasing levers reaches the top of the axle, in rotating around it, its weighted arm falls to the axle by its own weight, throwing a small block or dog under its lever-arm, and locking the latter rigidly at a fixed distance from the axle. The lever-arm being thus automatically locked at a fixed distance from the axle, as it continues its rotation it actuates a semi-annularly armed lever F F, raising and withdrawing the gravity-stop or pin before mentioned and releasing the cam-lever, rendering the brake-actuating mechanism inoperative. Then again, as each jointed-lever when rotating slowly reaches the bottom of the axle, its weighted arm again falls, this time away from the axle, withdrawing the small block or dog from under the lever-arm, throwing the latter to the axle, and entirely out of contact with the semi-annularly armed lever. This self-locking action of these jointed-levers at the top of the axle, and their self-releasing action at the bottom being both simply gravital, with nothing whatever to prevent action in either case when the car is moving very slowly, are both consequently entirely automatic and absolutely certain.

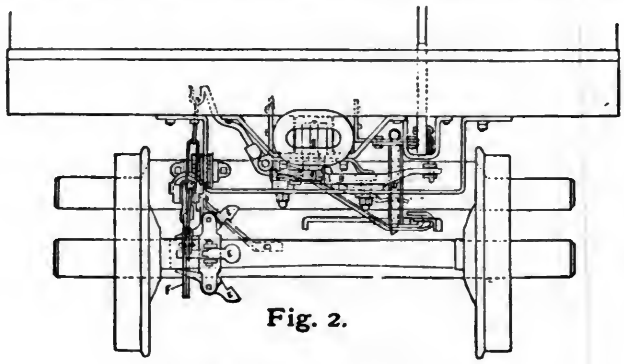


Fig. 2.

ROTE'S AUTOMATIC BRAKE.

There being four of these jointed rotating levers on the axle, they divide the circumference described into quadrants. Consequently, whenever the car is moving very slowly in either direction, or when it has come to perfect rest and is standing still, there is always in either case at least one—generally there are two—of these jointed-levers locked in position, actuating a semi-annularly armed lever, and keeping the gravity-stop or pin raised and withdrawn. Thus the brake is automatically rendered inoperative when the car is at rest or moving so slowly as to be easily and entirely under the control of the locomotive.

When, however, the car is at speed, these jointed rotating levers are thrown out of action by centrifugal force, and do not act upon the semi-annularly armed lever, whereupon the gravity-stop falls of its own weight, locking the brake-setting mechanism in operative position when the car is being drawn, but on the contrary locking it in inoperative position when the car is being backed or moved by a pushing engine. This latter is one of the most ingenious features of the invention. This automatic mechanism in connection with the axle is so arranged as to act to release the brake-setting mechanism when the speed of the car or train is reduced to within a few feet of a full stop, at which speed the train is under the perfect control of the engineer without the aid of the brakes.

Thus it will be seen that after a car has been moving at speed, and is being "slowed up" by the application of the brakes, as soon as the movement is reduced to almost a full stop, the gravity-stop will be withdrawn, no matter how great the pressure exerted on the draw-bar in slowing up, thereby automatically and while the car is yet moving, releasing or relieving the brake-setting mechanism and adapting the movement of the car or train to be instantly reversed without the necessity of first "taking up slack" or drawing out the draw-bars to relieve the brakes.

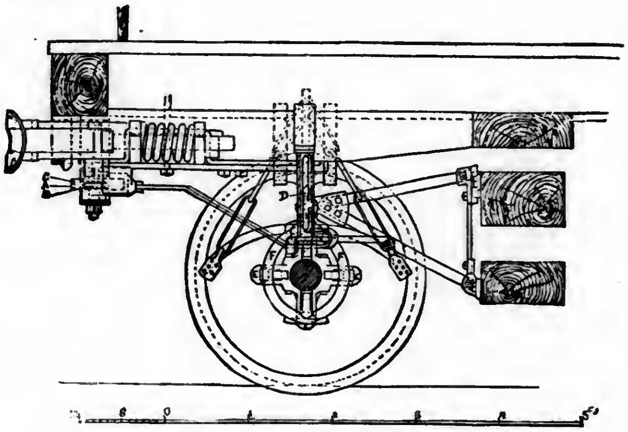


Fig. 3.
ROTE'S AUTOMATIC BRAKE.

This action, viz: automatically relieving itself as soon as the regulated speed is reached in slowing up, while the car or train is yet in motion, and offering no obstacle or impediment to the backing of the car or train immediately, without first "taking up the slack," is peculiar to this brake, making it entirely and absolutely automatic.

In slowing up, when the brakes are applied, they may be released at any time at the will of the engineer, and the speed restored by simply pulling out again.

The especial advantages claimed for the brake, may be stated as follows: It is entirely automatic and entirely under the control of the engineer; it adjusts itself automatically to suit either direction in which the car is pulled; it operates at all rates of speed above two miles an hour; it is complete in itself on each car, and independent in its action of the brakes on any other car; it relieves itself automatically when the train stops, avoiding "flatting" of wheels and allowing the train to be immediately backed; it does not interfere with the handling of trains or cars in the yards; it is easily rendered inoperative; it operates equally well on a long train as on a short one; trainmen need not be educated to its use, as it operates perfectly in trains where its presence is not known, and it can be applied to old or new cars without removing the trucks.

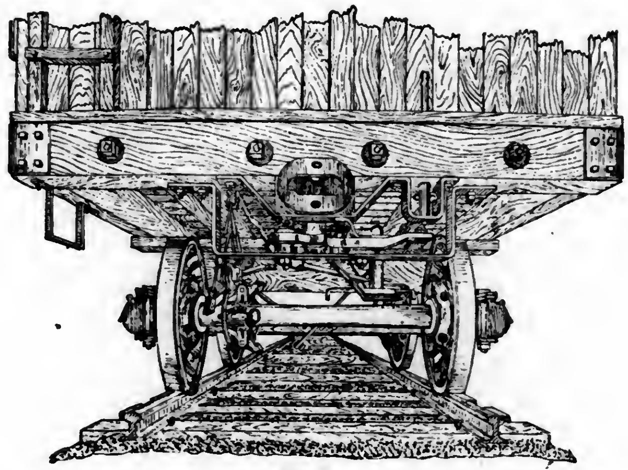


Fig. 4.
ROTE'S AUTOMATIC BRAKE.

The brake is now controlled by the Rote Automatic Brake Co., of Mansfield, O., and is meeting with success. Recently the New York, New Haven and Hartford Railroad Company adopted the brake and contracted for its use upon the entire freight equipment of its main and leased lines. The first cost of this brake is very much less than that of a vacuum or air-brake, and the expense of maintenance a mere fraction of what any form of air-brake costs. The Rote Company are willing and glad to equip trains in competition with any and every form and kind of brake, the railway making the competitive test to adopt the brake which it decides the best. As by the use of the Rote brake, buffers on both ends of cars can be dispensed with, and as brakes on one end of each car are sufficient, of course the usual brake-rigging used on the trucks at the other end on the Pennsylvania, Baltimore and Ohio, and other roads having high grades, is unnecessary, and it is probable that the saving thus effected will more than offset the cost of putting on the Rote brake, so that the actual expense to all such roads caused by adopting the Rote brake will be absolutely nothing.

Barton & Davis' Improvement in Steam-Engines.

ALEXANDER M. BARTON, of Strickling, Texas, and Philip Z. Davis, of Bertram, Texas, are the inventors of an improved movement for steam-engines or any machines operated by rotary motion, which is herewith illustrated and described. The object of the invention is to furnish a device by which to connect the piston-rod of the steam-cylinder with the disk or crank that is attached to the fly-wheel shaft by means of a lever, or a disk

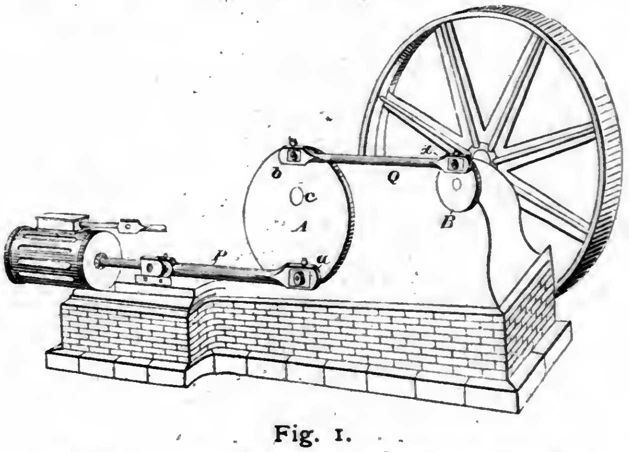


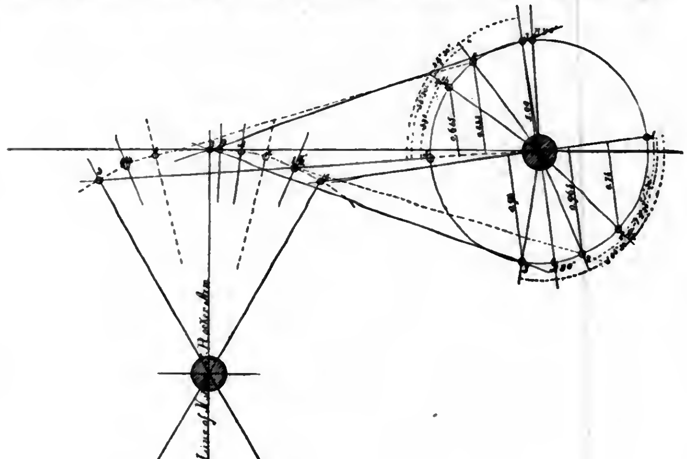
Fig. 1.
BARTON & DAVIS' IMPROVEMENT IN STEAM-ENGINES.

acting as such, in a manner that enables the piston-rod to operate upon its connecting-bar in a longitudinal direction, instead of the oblique one, which is necessitated by its being connected directly with the rotating disk or crank, and thereby to avoid angular vibration of the connecting-rod and reduce the friction of sliding surfaces, and also to gain an increased leverage on the crank upon the fly-wheel shaft while traveling under initial pressure

of steam. This increased leverage is gained through the combination of the arc-movement of the intermediate disk or lever with the crank-movement of the crank on the fly-wheel shaft.

In the accompanying cuts. Fig. 1 represents the device as attached to an ordinary steam-engine; Figs. 2 and 3, are explanatory diagrams showing the relative capacities of the improved movement as contrasted with ordinary movements, and Fig. 4 shows the device as applied to a locomotive.

The connecting-bar P, (Fig. 1) is at *a*, connected with the disk A, which takes the place of a lever, having its fulcrum at *c*, and forming two lever arms, the longer *a c*, and the shorter *b c*. As the points *a* and *b*, of the disk A, move in a longitudinal forward and backward direction, only the piston-rod is enabled to move uniformly, and as the lever-arm *a c*, is of double the length of the lever-arm *b c*, or of any greater length generally, it operates from the dead centers in the crank-circles to points above and below this plane passing through the center of motion of the disk or crank B, and thereby exerts the power through



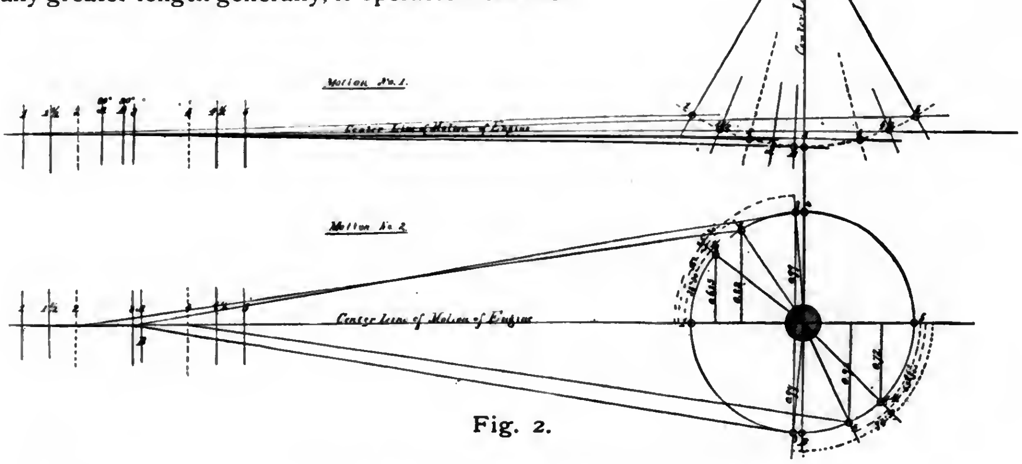
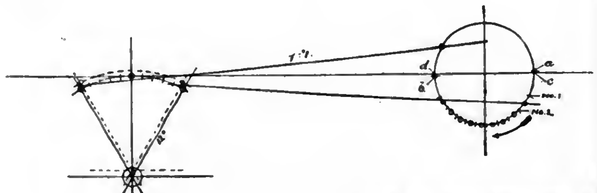


Fig. 2.

BARTON & DAVIS' IMPROVEMENT IN STEAM-ENGINES.

point *b*, wlth force increased by the proportion of the lever-arm. The connecting-bar P, connects the disk A, with the disk or crank B, which is to be of such a diameter as corresponds with the distance of the longitudinal forward and backward movement of the point *b*, in the disk A. The combination of the arc-movement of the lever or disk A, is established substantially as follows: The highest point of the arc-movement of the lever A, being in the same plane with the centers of motion of the disk or crank B, when perpendicular to a plane passing through the center of motion of the cylinder and passing below this plane when at the ends of the arc, thereby changes a greater distance of crank-travel while under initial pressure of steam than can be used with the direct connected engines when points of cut-off are the same in both machines.



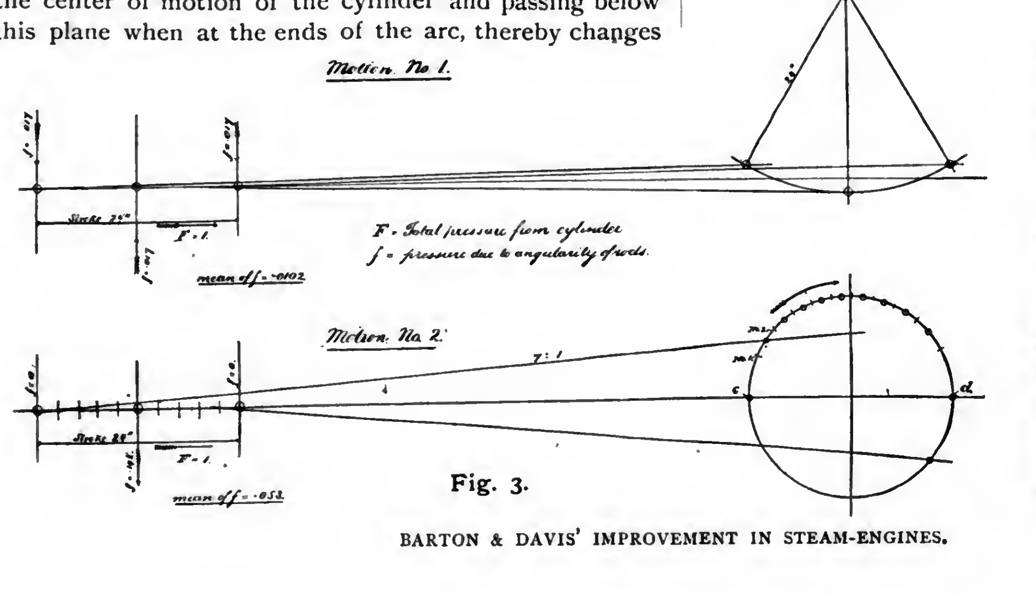


Fig. 3.

BARTON & DAVIS' IMPROVEMENT IN STEAM-ENGINES.

The accompanying tables, respectively referred to Figs. 2 and 3, show the advantages gained in the use of the improved device:

TABLES I (SEE FIG. 2).

FRICTION OF CROSS-HEAD AND GUIDES.

Pressure on piston = 1.
Mean movement of friction motion, No. 1 = 0.000654.
Mean movement of friction motion, No. 2 = 0.004162.
Ratio of cross-head friction motion, No. 1 to motion No. 2 = 0.1573.
Friction cross-head, No. 1, 16 per cent. of No. 2.

CRANK-ANGLES AND MEAN CRANK-ARMS FOR GIVEN PISTON POSITIONS

No. = piston, rocker, arm and crank position for motion No. 1.
No. = piston and crank positions for motion No. 2.
A = angle described by crank for given position of piston.
C = mean crank-arm (crank taken as 1) for given angles.
P = product of mean crank-arm and angle described.

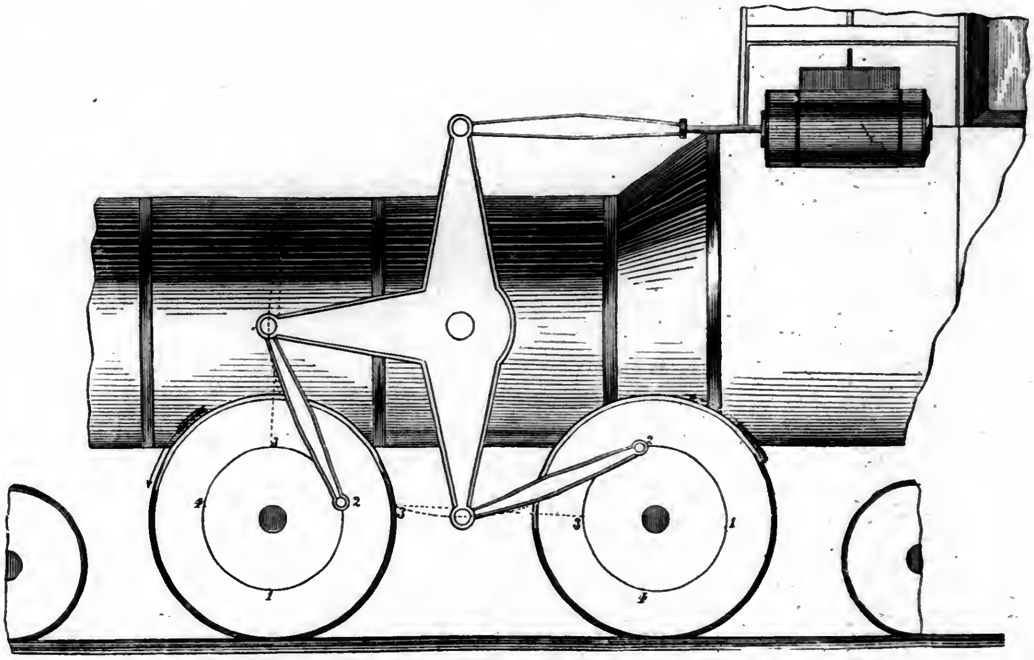
MOTION NO. 1.

OUTBOARD STROKE.				INBOARD STROKE.			
No.	*A*	*C*	*P*	No.	*A*	*C*	*P*
1	0	0	0	5	0	0	0
1½	51°30′	0.434	22.35	4½	38°	0.325	12.55
2	74°30′	0.605	45.07	4	56°30′	9.473	26.27
3	106°30′	0.801	85.90	3	84°30′	0.672	56.78

MOTION NO 2.

No.	*A*	*C*	*P*	No.	*A*	*C*	*P*
1	0	0	0	5	0	0	0
1½	38°30′	0.329	12.66	4¼	46°00′	0.39	17.94
2	56°00′	0.469	26.26	4	65°30′	0.54	35.37
3	85°30′	0.678	63.96	3	94°30′	0.734	69.36

Ratio of effect motion, No. 1 to motion No. 2.
Piston position, 1½—4½ 2—4 3—3
Ratio of effect, 1.14 1.165 1.07
Mean piston displacement, 90° motion of crank.
Motion No. 1, 452
" No. 2, .500



BARTON & DAVIS' IMPROVEMENT IN STEAM-ENGINES.

TABLES II (SEE FIG. 3).

	ROCKER AS DOTTED. From *c* to *d*.	ROCKER AS SHOWN. From *a* to *b*.	*b* to *a*.	From *c* to *d*.
Mean No. 1, =	2¾	2⅝	2¾	4¾
" 2, =	4½	4⅜	4⅛	8
" 3, =	5¼	5¼	5	10
" 4, =	5¾	5¾	5½	11⅛
" 5, =	6	6	5⅞	11¾
" 6, =	5⅞	5⅞	6	12
" 7, =	5½	5½	5¾	11½
" 8, =	4⅞	4⅞	4⅜	10¾
" 9, =	4⅛	4	4⅝	9⅛
" 10, =	2⅝	2½	2¾	5⅛
Total, ... =	47¼	46¾	47¾	94½
Mean, ... =	4.725	4.675	4.775	9.45
	x2			x2
Total mean,. =	9.45			18.90

From *a* to *b* = 4.675
From *b* to *a* = 4.775
Total mean,.... 9.45

N.B. From *c* to *d* = from *d* to *c*.

N.B. From *c* to *d* = from *d* to *c*.

Pressure on Crank Pin Motion No.	1	= 2
" " "	2	= 1
Leverage " "	1	= 1
" " "	2	= 2

The power derived from the leverage of the cranks is the same in both motions

4¾ per cent. power is saved by using motion No. 1 which is lost in motion No. 2, owing to the friction produced by *f*, against the guide-bars.

From this 4½ per cent., the loss by friction on rocker-pins and pivot estimated at 1.4 per cent., and the additional friction at main bearing estimated at .85 per cent., total = 2.25 per cent., must be subtracted.

The estimated gain of power in No. 1 = 2 per cent. nett over that developed in motion No. 2. (Simple Engine).

It is apparent that the operation of the device is not confined to any one class of engines, as any rotary motion may be benefited by applying the lever in a similar manner. In Fig. 4, the device is shown applied to a locomotive, the locomotive being drawn in sectional outline. Its operation in this instance is readily understood from the above explanation.

It is claimed by the inventors that in the application of the device to a locomotive, the following advantages are derived:

1st. That the cylinders are taken from the position they occupy on a direct-connected locomotive and placed under the immediate control of the engineer.

2d. That by the application of the intermediate disk or the lever A, to locomotives a gain is made as shown by the diagram in Fig. 2 from 7 to 16½ per cent. in crank-leverage on each crank while traveling under initial pressure of steam.

3d. That by use of the lever is also gained a correct distribution of the power of cylinder upon the driving-wheels, distributing it equally to both wheels, thereby avoiding the necessity of communicating the power to one wheel-end, transmiting from that to the other as with the direct connected locomotion.

4th. That by use of the lever and its direct connection with both wheels, each independent of the other, the connecting-bars are made to operate nearly at right angles to each other, thereby avoiding the tendency to slip upon the rail, from the fact that the two crank-pins upon the same side never pass between the axle and track at the same time.

5th. That by making a direct connection with both driving-wheels from the lever A, as shown, the power is applied to the front-wheel from a position perpendicular to the track, thereby giving a better distribution of power around the crank-circle and propelling the wheel in the

same direction, at all times avoiding the reactions as in case of horizontal connection.

The invention is now controlled jointly by the inventors and D. W. Barton, of Dodge City, Kans.

Hadley's Extension Car-Step.

GEORGE C. HADLEY, of Mumford, N. Y., is the inventor of an improved extension-step for railway-cars, that is herewith illustrated and described. This invention is applicable to all railway-cars, but is especially adapted for sleeping and drawing-room cars, its object being to provide an adjustable or extension-step to be conveniently dropped in position below and in front of the fixed lower

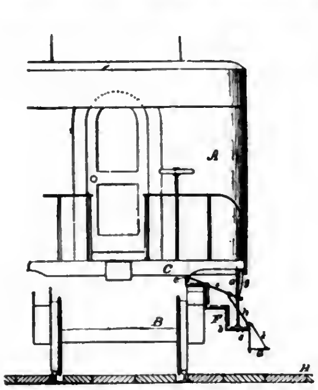


Fig. 1. Fig. 2.
HADLEY'S EXTENSION CAR-STEP.

step of the car, as commonly constructed, to assist persons to enter the car from a depot-floor level with the track, thus dispensing with the stepping-stool commonly used.

In the accompanying cuts, Fig. 1 is an end elevation of a portion of an ordinary sleeping-car, showing the flight of steps at one side thereof with the improved extension-step attached in place, parts not essential to the figure being omitted; Fig. 2, a similar view of the flight of steps of the car drawn to a scale twice the size, and showing the steps and a portion of the platform transversely sectioned, as upon the dotted line *x*, in Fig. 3, the extension-step and parts sustaining it being shown in position for use in full lines and folded, as when not in use, in dotted lines; Fig. 3, a side elevation of the flight of steps viewed as indicated by the arrow in Fig. 2, drawn to show further the forms of the parts that hold and sustain the extension-step in place, and Fig. 4, a plan of the same flight of steps viewed as indicated by the arrow *y* in Fig. 3, drawn to show further the extension-step and its supporting mechanism.

A is the body of a sleeping-car or other passenger-car; B, the truck; C, the bumper-timber; D, the platform, and F, the flight of steps leading thereto. The step-boards *d*, *d'* and d^2, and the risers *p*, forming the flight, are supported upon parallel angle-irons *b*, extending downward from the platform, there being vertical stays *a*, extending, respectively, from the end of the bumper-timber and the body of the car downward to connect with the lower step d^2, of the flight. The steps and risers are secured to the angle-irons *b*, by simple bolts or screws, all of which parts are of common construction.

G is the new extension-step added at the bottom of the flight of steps F, leading to the platform of the car, which serves substantially to divide the distance between the floor H, of the depot and the lower fixed step d^2. This step may be made of wood, like the other steps of the flight; but preferably of metal, and it is supported in place for use by the following means: *f* are two similar lever-rods held movably at one end in eyelets *c*, secured, respectively, to the under surfaces of the bumper-timber and the body of the car, so that their free ends may be swung upward and downward in vertical planes. *g g* are two similar curved slotted hangers pendent from the bumper-timber and body of the car, respectively, in position to receive the outer ends of the lever-rods *f*, and form confining-guides, within the slots *t*, of which the lever-rods make their vertical movements. The lever-rods *f*, terminate in knobs or short handles *l*, outside of the guides *g*, which may be seized by the attendant in raising the step G. *h h* are a pair of suspension-rods alike in all respects, attached with movable joints *r*, to the lever-rods *f*, respectively, at points near to and within the guide-pieces *g*. At their lower ends these rods are each provided with eyes or orifices *e e*, in which rest trunnions *v*, extending laterally in opposite directions from the ends of the extension-step G, by which means the rear part of the step is supported.

k k are another pair of rods or suspension-braces secured movably at their lower ends in eyelets *n n*, of the extension-step, which braces extend obliquely upward and connect with the suspension-rods *h h*, by means of freely-sliding eyelets or loops *o o*, by means of which braces the forward part of the step is supported. The suspension-rods *h h*, are attached to the lever-rods *f f*, between burrs *s s*, rigid with the latter, sufficient play being allowed between the rods *h h*, and *f f*, to permit of the movements of the parts necessary in changing the position of the step G, described further on. Burrs *u u*, rigid with the rods *h h*, below the eyelets *o o*, of the braces *k k*, form stops for the latter in their downward movements, and allow the

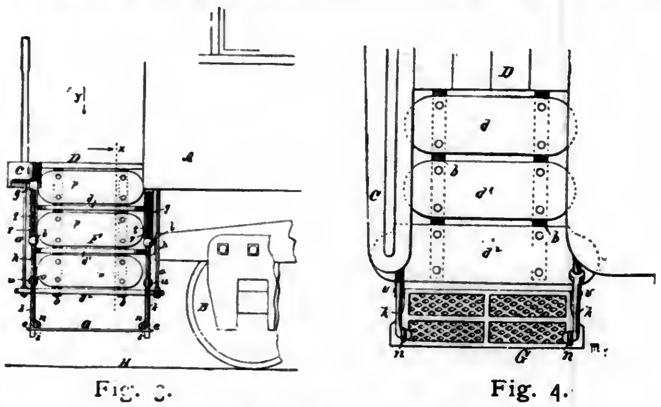


Fig. 3. Fig. 4.
HADLEY'S EXTENSION CAR-STEP.

braces to slide downward along the rods *h h*, only sufficiently to hold the step G, in a horizontal position. The suspension-rods *h h*, and braces *k k*, are made of such lengths and forms as to hold the step G, when adjusted for use, in such position that the vertical distance between it and the step d^2, is the same as that between the latter step and the step *d'*, or between the steps *d'* and *d*; also, to hold the step G, forward of the step d^2, at about the same distance at which either of the rigid steps of the flight is forward of the one next above it. On these accounts the step G, becomes substantially a regular step of the flight F, and when thus held greatly assists passengers to mount the fixed steps of the car.

When not in use, the step G, is raised to the position shown in the dotted lines in Fig. 2, in which it lies flat upon the lower fixed step d^2, and, being quite thin, does not interfere with the use of the latter step by persons going up and down the flight. In the act of raising the steps to its position of non-use, shown in dotted lines, the balls or handles *l l*, of the lever-rods are grasped by the attendant and carried upward, the step swinging back from gravity to the position indicated. Small points *i i*, of the rods *h h*, extending downward below the under surface of the step G, pass down in the opening a', back of the step d^2, when the step G, is withdrawn from use; which points serve to prevent the latter step becoming displaced by the jar of the car when in motion, or from other causes. When the step G, is raised to the position upon the step d^2, as stated, the loops *o o*, of the braces *k k*, slide upward along the rods *h h*, and the movableness of the joints or rod-connections *r*, *o*, *e* and *n*, permits the easy movement of the step from either position to the other.

The parts of the suspending mechanism for the step G, are located on one side under the bumper-timber, and on the other side under the body of the car, and consequently are out of the way of persons passing up or down the flight in either position of the step.

When the adjustable step is brought into position for use, it is simply raised by the attendant from the step d^2, sufficiently to bring the points *i*, out of space a', back of the step d^2, and brought forward off the step d^2, and let down to the place shown in full lines. This adjustable step is not needed when the car stands at the side of an elevated platform; but generally passengers are required to enter the cars from depot-floors on a level with the track. In such cases the auxiliary step is very useful and convenient, as the distance from such floors to the lower step of the fixed flight is too great to be overcome by a single reach of the foot.

Currie's Car-Brake.

CHARLES E. CURRIE, of Butte, Montana, is the inventor of an improved hand-brake for railway-cars, the construction and operation of which is shown in the accompanying cuts. Fig. 1 is a side elevation of the

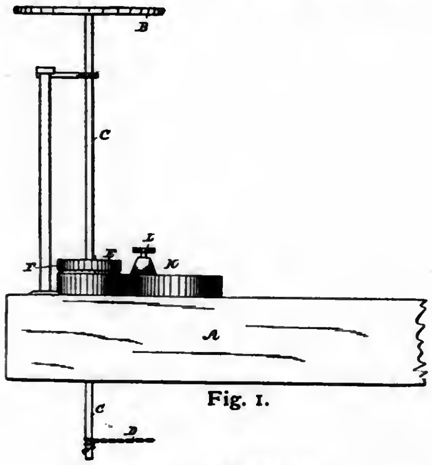


Fig. 1.

CURRIE'S CAR-BRAKE.

device; Fig. 2 a longitudinal vertical section; Fig. 3 a plan view of the same, and Fig. 4 a detail view of the disk inverted.

A represents a portion of the platform of a car; B represents the hand-wheel, and C, the hand-shaft on which it is fixed. The chain-shaft is journaled vertically in the platform, and extends below it to receive and wind up the brake-chain D. E is a disk fixed upon the shaft C, and provided with a downward-projecting rim F, within which is a circle of ratchet-teeth G. H is a detent

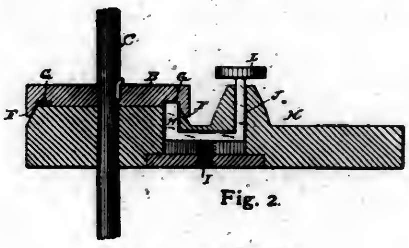


Fig. 2.

CURRIE'S CAR-BRAKE.

fitted to slide vertically to engage the teeth G, to hold the disk against the turning strain of the brake-chain. This detent is provided with a stud I, around which is a spring which continually lifts upon the detent to throw it into engagement with the teeth. The detent is also provided with another stud J, projecting up through the base K, and provided with a pedal L, upon which the foot of the operator may press to disengage the detent from the teeth G, of the disk. The base K, is to be secured to the platform of the car, and it serves to support the detent and spring, and is itself kept in a fixed relation to the

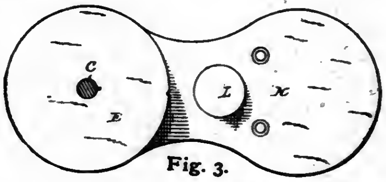


Fig. 3.

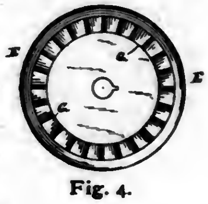


Fig. 4.

CURRIE'S CAR-BRAKE.

disk and teeth by bearing upon the shaft C. The rim of the disk projecting down around the teeth and the teeth facing downward, prevents any possibility of dust accumulating in the teeth. The pedal also flares out over and to all sides of the hole through which stud J, rises, thereby preventing dust from entering the device at this point, thus insuring its constant readiness for use, so that a brake thus provided may always be depended upon.

The brake is claimed to be simple in construction, strong and durable, accurate in its operation, and readily applied to any railway-car, while its locking device is entirely protected from dust and dirt.

Rothrock's Feed-Water Heater for Locomotives.

OSCAR ROTHROCK, of Beech Creek, Pa., is the inventor of a feed-water heater for locomotives, which is herewith described. It is claimed by the inventor that this device gives a feed-water heater that can be used to advantage on locomotives and other engines, and will supply water of any desired temperature up to 212 degrees, utilizing the waste heat from the combustion-chamber and spare exhaust.

The heater is a tank made of steel or iron plates secured to the outside of the boiler, and supplied with safety-valve, steam-gauge, water-glass, etc., and has a connection directly or indirectly at the fire; the exhaust-pipe passing through it, and the valves being arranged to throw the exhaust in and out of the heater at will.

The intention is to fill this heater from a cold water supply using the ordinary pump or injector, the engines exhausting into the stack and the fire acting on the water in the boiler meanwhile. The tank, which contains five to twenty barrels of water as the special circumstances require, having been filled, the engineman opens the inner fire-door or doors, throwing the fire or hot gases against the heater, and turns a valve in the exhaust-pipe or smoke-box throwing the exhaust through the heater, and the pipes carrying the latter being large and free from many turns, there will be littte or no back pressure. By this means the heat of the furnace now constantly going to waste, in locomotives especially when standing at stations or temporally inactive, as well as the spare exhaust, is utilized in heating an additional supply of water, enabling one to carry a slow, heavy fire instead of a forced fire, and effecting a heavy saving in fuel with the many advantages incident to the use of boiling feed-water.

This heater consists of a tank, reservoir, or dome and jacket, secured to the outside of the boiler, forming either a separate and independent structure with walls of solid sheet metal on all sides, or a jacket-dome surrounding the fire-box or a part of the boiler, and having a connection at the fire, directly or indirectly, with a pipe carrying the exhaust-steam from the exhaust ports into the reservoir, and from the reservoir back to the smoke-box or to a suitable receptacle, from which it is allowed to escape into the air. Where water of a very high temperature is desired and thereby the greatest economy of fuel, the heater is made a part of the walls of the fire-chamber, in certain cases being placed in front of the boiler, the fire being much under both heater and boiler. When it is desirable to control the heating directly at the fire, this reservoir is placed in front of the ordinary fire-door opening in a boiler, and both the boiler or furnace and heater are supplied with doors. The inner door or doors may then be lowered into a receptacle or swung out of the way and the outer door closed. On small portable engines, etc., the heater is made the front or face of the fire-box, the fire-door and its connections being placed out on the heater. For all of these boilers an amply large pipe is connected to one or both, usually both exhaust ports, and for a locomotive this pipe is carried back under the lagging and covering of the boiler, or the pipe is covered with felt or other suitable material and secured to the face of the boiler, usually along the foot boards to the cab, run to the top of heater, given a number coils within the heater and run out at bottom, or taken in at the b ttom and out at the top where to discharge into the air.

That portion of pipe within the heater is made of very large proportions and can be half the thickness of the outer extensions, and is usually made with the heater-tank, securing it at entrance and exit by the ordinary steam and water-tight joints. The pipe may, however, pass in and out of the heater in suitable steam-tight packing boxes. This pipe is supplied with a large pipe or valve at or near its connection with the exhaust-ports, or in the stack, which may be opened and closed by the engineer from his seat by a rod, lever, or thumb-screw.

This arrangement enables the engineer to blow up the fire with the exhaust, if necessary, throw it into the heater at will, let it escape into the air, or go back to the smoke-box.

The heater has a connecting pipe at the top to the steam-space of the boiler, with a check-valve or stop-cock, to be closed when pumping or injecting water from heater to boiler of lower temperature than the water in the boiler, with one or two connecting pipes for the passage of the water from the heater to the boiler—usually two pipes, the one being supplied with a check-valve and the usual hot water pump placed in the other, the supply being arranged above the pump so that the hot water may run into it. The same pump may supply the heater and boiler, at intervals. It has a pipe connecting it to the cold water tank or supply, and an ordinary injector or pump is in this pipe to supply the heater with cold water. The heater may be a separate dome secured to the fire-box by ears and tap-bolts, in this case having a bottom sheet.

The water can be arranged to be fed at intervals from the heater to the boiler, or can go constantly, can be pumped, injected, or be permitted to enter the boiler or boilers by gravity.

This device is applicable to locomotive and portable boilers generally, and to many forms of stationary and marine boilers.

Meyers' Seal-Lock for Car-Doors.

Frank H. Meyers, of Philadelphia, Pa., has recently invented a seal-lock for the doors of freight-cars and other similar uses, the invention being explained by the accompanying cuts. In this device a key-lock is com-

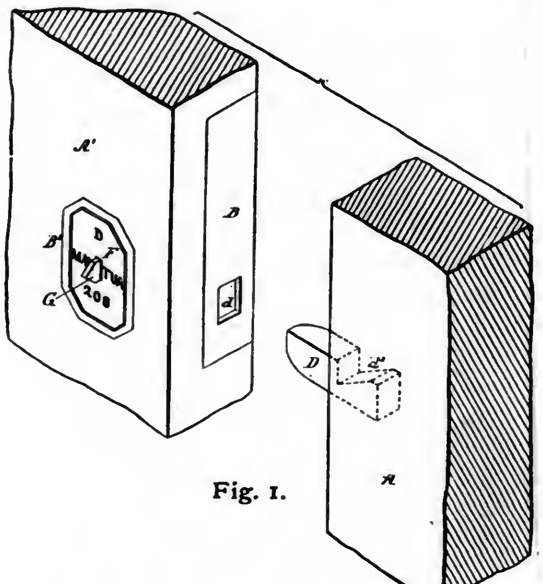


Fig. 1.

MEYERS' SEAL-LOCK FOR CAR-DOORS.

bined with a frangible seal to prevent the key from being inserted in the lock until the seal has been broken, and the object of the invention is, first, to construct a simple form of seal-lock, and, secondly, to combine the seal-lock with the door and frame of the car, so that only the escutcheon and seal and its retainer will be exposed when the door is closed.

Fig. 1 is a perspective view illustrating the manner of applying the improvement; Fig. 2 a face view of part of the edge of the door, with the seal removed from the escutcheon; Fig. 3 a sectional view through the door and

post, with the inner face-plates removed from the lock; Fig. 4 a transverse section through the lock and door, and Fig. 5 a perspective view of the seal.

A is the post at the side of the doorway, and A′ represents a portion of the sliding-door of a freight-car. The casing B, of the lock proper is let into the door on the inner side, while the escutcheon B′, of the lock, with a suitable key-hole *b*, is on the outside of the door. On

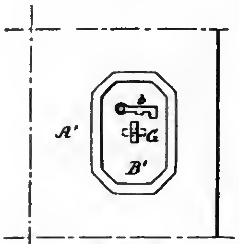


Fig. 2.

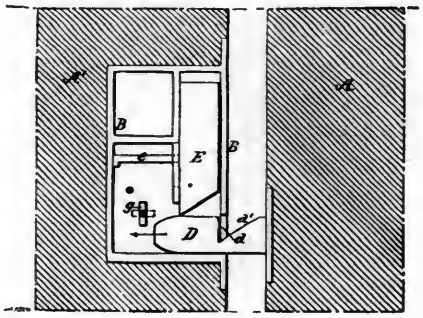


Fig. 3.

MEYERS' SEAL-LOCK FOR CAR-DOORS.

the door-post is a hooked bolt or finger D, adapted to enter a suitable opening *d*, of the lock-casing when the door is closed. The nose of this bolt is rounded or beveled, and within the lock is a vertically sliding gravity-bolt E, the lower end of which is beveled, as indicated in Fig. 3, so that when the bolt D, enters the lock it will raise the locking-bolt E, which will ride over the bolt D, until it falls into the notch *d′*, as the door is completely closed. The door thus locked can be unlocked and opened again by inserting a proper key through the key-hole *b*, in the

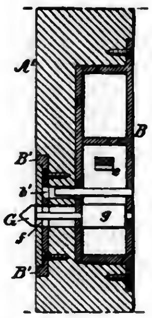


Fig. 4.

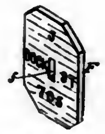


Fig. 5.

MEYERS' SEAL-LOCK FOR CAR-DOORS.

escutcheon, and turning it so that its bit acts on the arm *e*, (Figs. 3 and 4), on the bolt E, and raises the latter clear of the bolt D.

To seal the lock and prevent access to the key-hole after the door has been locked, use is made of a frangible seal F, which is a polygonal plate, moderately thin and adapted to a corresponding recess in the face of the escutcheon, so that the face of the seal will be about flush with the face of the latter, and preferably, also, with the door, as shown in the cuts.

To retain the seal in place to cover the key-hole, a rotary catch or turn-buckle G, is used, the spindle of which is free to turn in the casing of the lock, and within the latter is provided with extensions or fingers *g g*. In the center of each seal is an oblong slot *f*, through which the head of the turn-buckle can pass, as shown in Fig. 1, when the seal is inserted in its place in the escutcheon. When the turn-buckle is in this position, one of the extensions *g*, will be in the path of the bolt D, which, as it enters the lock in closing the door, (Fig. 3), will strike that extension *g*, and turn the spindle a quarter-turn, so that the turn-buckle will lie at right angles to the slot in the seal-plate F, and prevent the latter from being withdrawn; nor can the turn-buckle be turned so long as the bolt D, remains in the lock, for the extensions *g g*, lie horizontally on the top of the bolt and prevent such movement. To get at the key-hole, therefore, it becomes necessary to break the seal.

The seal is preferably made of cross-grained wood, on which the desired names, numbers, or other marks are impressed by stamping. A seal of this material is easily made, is very cheap, and readily broken by the insertion of a suitable instrument between the seal and the edge of the recessed escutcheon.

In applying this invention to freight-cars of a railway, each station on the road is provided with a number of seals all stamped with the name of that station, and consecutive letters and numbers, with no duplicates; so that if any one breaks the seal and gets into the car on the route, he cannot replace the seal with a duplicate, but must use one with the name of the station where the car then is, so that when the change is discovered by comparing the copy of the shipping manifest with the car-seals, the responsibility can be traced back to the proper person.

In many seal-locks now in use the entire lock, or a large portion of it, is on the outside of the car, so that by a blow of a coupling-pin or bar in the hands of a malicious person, the bolt, hasp, or even the lock-case can be easily broken, and an expensive lock thus rendered useless. But by putting the lock proper on the inside, as in this invention, and leaving nothing but the escutcheon and the seal exposed, there is less opportunity for, or liability of, injury to the lock.

An Ingenious Car-Door Closing Device.

AN inventive Australian has devised an arrangement by which the doors of railway-carriages are closed and kept closed while the train is in motion by a lever worked by the motion of the carriage-axle. When the train stops the device ceases to work and the door may be opened. It might be useful in Australia and Europe, where, except in Switzerland and some parts of Southern Germany, the doors of railway-carriages are on the side, but would be of no use in this country. In England, however, there is a growing prejudice to the locking of carriage-doors, and it is now done on very few, if any, of the lines.

THE judges of awards at the New Orleans Exposition have, after careful examination and comparison, declared that the firm of Riehlé Bros., proprietors of the Philadelphia Scale and Testing Machine Works, are entitled to three first-class medals. One for their Self-Adjusting Railroad Track Scale with Rocking Bearings, one for their Spring Testing-Machine, and one for their well-known Furnace Charging Scales. This is considered a high compliment to Philadelphia mechanics, and one well deserved by this enterprising firm.

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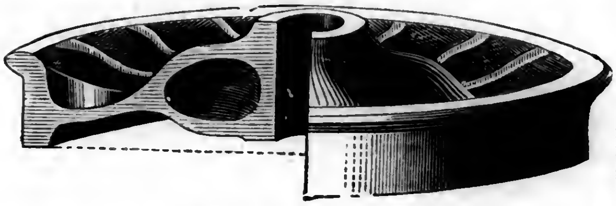

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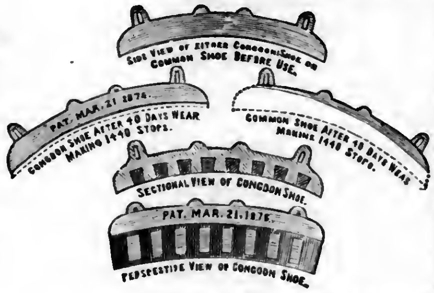

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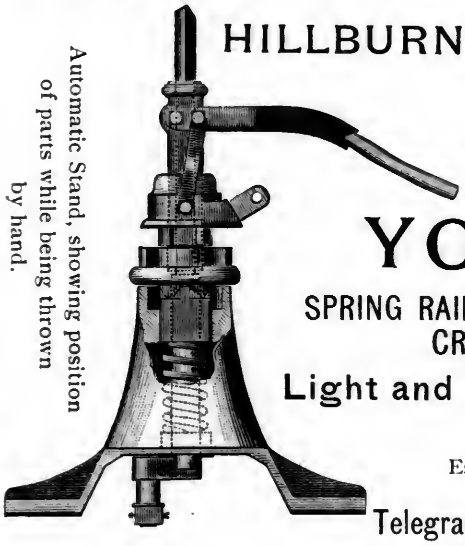

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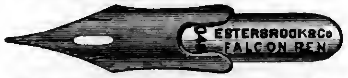

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American Railroad Journal.

WHOLE NO. 2,566.] NEW YORK, JULY, 1885. [VOLUME LIX.—NO. 4.

ACCIDENTS FROM SPREADING OF RAILS.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN the early days of American railways, a derailment from spreading of track was a very rare occurrence, and when, after a few years, accidents from this cause were reported from time to time, old hands opened their eyes with astonishment on learning that spreading of rails had caused a smash-up. Accidents from any other causes were considered as matters of course and unavoidable, with the exception of such as were the result of carelessness or disobedience of orders. It was understood that breakages would occur under the most careful management, but there was no excuse for a case of spreading of rails, and there was a great deal of sharp criticism of the management of all roads that allowed their tracks to spread sufficiently to cause derailment. The word "allowed" is used here for the reason that ties were *allowed* to remain in the track, after they had become so decayed as to offer no resistance to the spikes pulling out. With the old style of light rolling-stock and moderate speed of trains, rails would not spread or roll over if well spiked on a good supply of sound ties, and the reason tracks spread was because they were allowed to do so through gross mismanagement, or the exercise of that kind of economy that saves a thousand dollars *in material not furnished*, and pays five thousand dollars or more for loss of life and injury to persons and property in consequence; and it was only those roads that were mismanaged that first suffered from spreading of rails.

But, after a time, when fifty per cent. or more was added to the weight and speed of trains and the destructive "Moguls" came into use, the best managed roads in the country began to have trouble in keeping rails in place. Track that was safe under ordinary traffic failed under the new conditions of things, and the only remedy seemed to be more ties and spikes; but this afforded only temporary relief. The excessive vertical and lateral strain soon loosened the spikes, moisture followed, causing premature decay of the ties, and thus they no longer held the rails in place, and derailment and disaster was frequent. Notwithstanding the fact that the condition of American railways has been greatly improved within the past fifteen or twenty years, accidents from the cause under consideration have been on the increase. Nine years ago, thirty derailments were reported from this cause in twelve months, and in the twelve months including part of the years 1882–83, ninety-two derailments are reported from this cause, and for the nine years ending in June 1883, 360 serious accidents were caused by spreading of rails. Nearly all these accidents occurred on roads that were in better condition than formerly, and on which such accidents had rarely, if ever, occurred.

As a rule, the tracks where these accidents occurred were well ballasted and well tied, with heavy steel rails spiked in the ordinary manner, and why such track should spread was a mystery to those who were not given to the study of cause and effect, and the following will explain why the improved tracks of to-day spread more frequently than did those of lighter material in former years:

When tracks were laid with light iron rails the rolling-stock was light, causing but slight depression of the rails so that on returning to their normal condition when relieved of their load, they exerted but little force on the spikes in their upward spring, and the spikes were not pulled out of the ties. Moreover, but little or no ballast was used at that time to hold the ties firmly in place, the latter lying loosely on the surface of the road-bed and offering but slight resistance to the upward spring of the rails as exerted on the spikes, while the ties were kept in contact with the rails. In other words, the forces exerted on the spike-heads were not sufficient to loosen the spikes so as to cause derailment, save in rare cases where soft ties were used and not fully spiked. So long as the spike-heads had a bearing on the base of the rail there was no spreading, but it was when the spikes had not sufficient hold on the tie to lift it and keep it in contact with the rail on its reaction after depression that rails could spread. When moisture enters the tie following down the spikes, a pulpy substance is soon formed around the spikes. This is the commencement of decay and the spike losses its hold on the timber, and the spring of the rail pulls it out gradually, until the tie no longer returns with the rail when recovering from its depression, but remains at the lowest point of depression when under its load, and the rail comes up without it, leaving a space of an inch, more or less, between the ties and rails. Some of the ties, being narrower than others, or lying on a softer foundation, sink further in their beds than others, so that when the rail is relieved from its load it only has a bearing on the highest ties. On these ties the spike-heads will be above the base of the rail, while the ties that have been depressed the most will hang loosely by the spikes to the rails or be suspended by the spike-heads. Trackmen shove the spikes to their place, but the next train pulls them up again, and, owing to more moisture and decay, the spikes soon lose their hold entirely.

Now that a liberal supply of heavy ties are embedded in an abundance of ballast and surmounted with heavy steel rails, well spiked, it would seem that there should be no more trouble from spreading of track; but investigation proves that the causes have increased faster than the remedies. That is to say, the means of prevention have not kept pace with the destructive forces that have been brought forward by the demands of a heavy and fast traffic, which is rapidly increasing. When the heavy steel rails now in use are depressed by monstrous

locomotives under high velocities, being suddenly released from pressure they regain their normal position with great force, which, acting on the spikes with greater force than light iron rails that have but little spring, draws them from the heavy ties which are so firmly anchored in the ballast that the spikes have not sufficient hold on them to raise them from their bearings, and thus the spikes pull out. Moreover, the lateral strain on the rails is much greater than formerly. This has a tendency to force the spikes into the grain of the wood, away from the outer side of the rails, thus widening the gauge and increasing the lateral oscillation which also augments the lateral strain, and by enlarging the space around the spikes admits more moisture and hastens the decay of the ties. It will thus be seen that with the greater solidity of the ties, together with the increase in force, number and frequency of the vertical and lateral strains on the spikes, the track is more liable to spread than with the lighter traffic, lower velocities and less stability of superstructure and iron rails of twenty years ago, and that while tracks are safer in many other respects than formerly, spreading is on the increase for the reasons set forth.

When instances of spreading of rails had become somewhat frequent, some of the progressive trackmen sought to prevent it by driving extra spikes on the outer sides of the rails, and in cases where the supply of spikes was limited, they were pulled from some of the ties (every second or third) on the inner side of the rails and driven on the outside, and some contractors, in laying track, thought it a stroke of economy to leave out the inner spikes on every alternate tie or every third tie, according to the quality of the timber and nature of alignment. In doing this they argued that they were making just as good a track with less material than if full-spiked, as every tie was spiked on the outerside of the rail and thus could not spread. So far as the *lateral displacement* of the rail was concerned this was correct, but the important fact that rails frequently *roll over* was overlooked. It is rare that there is sufficient lateral displacement to cause derailment although that is the primary cause, and rails roll either way, according to circumstances. Lateral displacement increases the force of end-thrusts of axles, which roll the rail outward, but if the rails have spread far enough to allow the outer edges of the treads of wheels to have their bearing inside the vertical center of the rails they roll inward. On curves the inner rails are likely to roll inward for the reason that wheel-flanges follow the outer rail, which brings the wheels on the inner side to the edge of the rails, and derailment occurs from the displacement of the rails on that side. On straight lines bad surface and alignment changes the powerful thrusts from side to side and the rails will roll either way, according to the nature of the imperfections of the track. If there is a kink in the alignment and a low joint opposite to it, a heavy lurch is caused in the direction of the low joint or center, as the case may be, but the kink alone, if on a good surface, will cause displacement and a greater strain on the spikes than an uneven surface with good alignment. The forces that tend to pull spikes out of ties are numerous and constantly at work, and a great many plans have been tried to prevent rails from spreading, but no arrangement of spikes has thus far proved satisfactory. Double-spiking is not a specific remedy for the evil. Wood blocks and fish-plates have been spiked to the ties to brace the rail; cast-iron guard-rail braces have been tried with several spikes to each brace, and some patent wrought-iron braces fastened with spikes are in use, but they all get loose from the constant shocks, jars, vibrations, vertical and lateral strains, rot, frost, rain, etc., and railway officials who have studied the matter have decided that the spike is a primitive fastening, and not up to the present and future requirements of American railway practice, and that something better must be found for future use as a rail-fastening.

A PLEA FOR LIGHTER ROLLING-STOCK.

BY CHEMIN DE FER.

[Written for the AMERICAN RAILROAD JOURNAL.]

I DON'T know whether or not George Stephenson was an inspired prophet, but certain it is that his prediction that a railway speed of sixty miles an hour would be but little exceeded even when years of study had been spent upon the betterment of railway operation, has thus far proved true. With the exception of a few "spurts," no trains attain a speed as high as sixty miles per hour and we have yet to see—in this country at least—such a speed maintained for a lengthy journey. In distances of five hundred miles and upwards our fastest express-trains do not attain a speed of over forty-five miles an hour, and while of late there has been a noticeable improvement made in the time between distant points, this improvement seems to have been accomplished through other means than the mere increase of velocity. Thus our railways are saving time with commendable energy in running express-trains with few stoppages between important centers, and every provision is made to insure quick connections and prompt handling of traffic; but when it comes right down to the question of improving the capabilities of American locomotives little has been done. *The Locomotive* truly remarks in a recent article that compared with the engine of fifty years ago the modern locomotive offers but little improvement; and I see it is hinted that the old inside-connected locomotives of twenty or thirty years ago, were capable of better work than the shining and beautiful monsters of to-day. The old locomotives may not have been pretty to look at, but certainly they did effective service, and despite the manifold improved mechanisms which grace their successors, the achievements of these veterans of the service have yet to be surpassed.

The radical improvement of the locomotive is a problem awaiting an inventor's solution. I do not believe that we will have engines capable of pulling, at phenomonal speed, trains like those now run until there is a radical change in construction. Just what that change must be no one can say, otherwise there would be no problem to solve, but in one respect at least our railways seem to be making wonderful "backward progress," so to speak. The many improvements recently introduced in car-construction have resulted in a great increase of weight in these vehicles, and the parlor and sleeping-cars of to-day are enormously heavy. Even the ordinary passenger-car has taken an extra weight upon itself, and somehow or other, the handsomer the cars the more they weigh. It is folly to assume that this increased weight does not add materially to the burden of the locomotive, and in considerable

measure retard the speed of a train. A train consisting of half-a-dozen Pullman's is a formidable load for an engine to pull at a high rate of speed, nor does any necessity seem to exist for such ponderosity. True, a heavy car is apt to ride more easily and jolt less that a light car, but an increase in the elasticity of the springs would remedy this defect and furnish a light car in nearly every respect as comfortable as a heavy one. It may also be said that a heavy car is safer than a light car and less liable to derailment, which is true, but other precautionary measures can be taken than increasing the weight of the car, and in fact derailments are more common than formerly despite this increase of dead weight.

Certainly there is no reason why a light car cannot be made in every way as handsome, comfortable and safe as a heavy one, and with a question so eminently practical as this, it seems strange that all efforts in the direction of improving the construction of passenger-cars have been made seemingly with the purpose of increasing the weight proportionately to the interior and exterior improvement.

If George Stephenson was right, and we are never to reach a very high rate of railway speed, we can at least see to it that our failure in this respect is not owing to any laches on our part, and prominent among the drawbacks in our present methods of railway operation is an unnecessary weightiness of trains. A plea for lighter rolling-stock is a word in behalf of high speed, and possibly if we were to go back to the light cars of former days we would find that our present locomotives are, after all, better than their predecessors. Unfortunately all improvements introduced into locomotive-building have been accompanied by an increased demand upon their services. They improve in the same way a youth betters himself in getting an increase of salary just enough to cover the increase of cost in the necessities of life. A locomotive of to-day may be more powerful than one of years past, but a great deal more is expected of it. The introduction of lighter rolling-stock will to a considerable degree give it some chance for showing what it can do in comparison with the primitive engines whose efforts are yet unsurpassed, and it is a little strange that in this age of utility and common-sense rivalry, roads will enter into active competition and vie with each other in the beauty of their rolling-stock, and materially damage their prospects of acquiring a reputation for high speed by the wholly unnecessary weight given their cars.

THE OTHER SIDE OF THE PROMOTION QUESTION.

BY G. C. W.

[Written for the AMERICAN RAILROAD JOURNAL.]

I HAVE been much interested in reading the articles published in the April and June JOURNALS by an anonymous railway superintendent on the subject of promotion in railway service, and, if permitted, I would like to advance a few arguments on the other side of the question. "Superintendent" claims to speak entirely from the traveling public's standpoint and not in his official capacity. Permit me, then, to speak from an official point of view and also to make the broad assertion that the interests of the traveling public and of the railway itself are identical in this respect. It matters little from which side the argument is advanced, it is to the interest of the railway to secure the best possible class of trainmen, and it is to the interest of the traveling public that such a class should be secured. Therefore, I cannot see the precise logic by which "Superintendent" assumes that there is disloyalty to the interest of his road in advancing the interest of the traveler.

But it is evident that the writer in question has no love for the strict system of promotion, whether it be exercised in one interest or the other, and much that he says about the matter under discussion is undeniably true. Doubtless it would be very discouraging for an unusually competent man to feel that he is tied down to a poor position simply because inferior men who have been longer in the employ of the road than himself stand in his way, but there is no earthly necessity why this state of things should exist. It is entirely practicable for a railway to adopt a system of strict promotion and yet provide for the ample recognition of special or peculiar talents. Advancement along the grades for special merit is not at all inconsistent with the theories of promotion, and the "civil service reform" rules, as my friend calls them, can be reserved for the steady and reliable man who does his work well and does not belong to the class of geniuses. If, as "Superintendent" claims, it is hard for a man to feel that length of service alone will insure his advancement, is it not equally hard for another man to feel that length of service will not be reckoned as any claim to promotion? It has been my experience that the only "show," so to speak, that train-hands have of showing their ability is doing what they are told to do, and doing it faithfully and well. The opportunity for the exercise of brilliant talents is rarely afforded them and comes more through chance than through design. Now if we are to establish the rule that special achievement alone is to warrant promotion are we not doing an injustice to the men who from the nature of their particular line of employment have absolutely no chance whatever to distinguish themselves? Do we not quite as effectually destroy zeal in the one case as in the other? Surely it would be very disheartening to a man to know that his chance of promotion did not lie along the regular path of his duty, and, at the same time, such a knowledge would be subversive of railway discipline. I presume "Superintendent" will admit the necessity for discipline in railway management. I also presume he will admit that, in the main, discipline consists in the strict observance of railway rules and regulations. Therefore, he should be willing to admit that railway discipline can best be obtained by the encouragement of strict attention to duty. Having granted this much, I claim he must admit that promotion should be awarded fairly and impartially; and such award is impossible if a road must wait until some special act on the part of its employés calls for immediate recognition in the shape of promotion. It is in routine work that a railway employé should excel—therefore his excellence in routine work should entitle him to liberal treatment; yet "Superintendent" would seem to be in favor of reserving promotion until an employé did something of a "sky-rocket" nature. According to his view—I may wrong him, but he is certainly open to such imputation—the actual duties of a railway employé are matters to occupy the latter's time when he has nothing else to do.

Furthermore, there is but one safe rule by which all

favoritism or appearance of it can be avoided, and that is by the exercise of strict promotion according to length and excellence of service; save, possibly, in special cases where a railway employé's aptitude and ability are so marked that he may be safely advanced without fear of creating jealousy and dissatisfaction among his fellow employés.

Another point that I would like to combat is the theory held forth by "Superintendent" that it is better to avoid a "class creation"—the railway employé—and that a little outside blood is a good thing for a railway to infuse in its system. I think this view of the case is a mistake. To a certain extent the railway employé should be regarded by the railway management as belonging to a privileged class. He should feel that there will be no outside competition with his services, and that he is secure in his position during good behaviour. Still again, a railway necessarily suffers if it is constantly recruiting its ranks from other fields and perpetually imparting the necessary instruction and information to a set of green hands. A railway should train its hands, not teach them, and with the system of promotion the employé is gradually fitted for the place he holds by years of actual experience and training. He learns himself what his duties are, and does not have to be taught them.

In conclusion I would heartily coincide with "Superintendent" in holding that "the reward of meritorious service is the most powerful means of securing intelligent labor," but I do not coincide with his definition of meritorious service. To my mind the most meritorious service a railway employé can render his road is strict attention to duty, and it is this species of service that I would recognize in the adoption of the system of promotion. My anonymous friend concludes his latest contribution with an aphorism to the effect that "promotion should be a reward—not a pension." Let me follow his example and state as my humble opinion, that promotion should be a growth—not a creation.

LEGAL REQUIREMENTS UPON THE MECHANICAL DEPARTMENT OF RAILWAYS.

BY WILLARD A. SMITH.

[A Paper read before the recent Convention of the American Railway Master Mechanics' Association.]

RECENT legislation and decisions of the courts have made manifest an increasing disposition, on the part of the makers and interpreters of the law, to hold railway companies responsible for a high degree of perfection, not only in their methods of operation, but also in the machinery which they employ. On the subject of this legal responsibility, there seems to be in the public mind considerable misinformation; and on the part of railway officials, to some extent, a lack of definite knowledge. It is true that questions arising under this head are of such varying natures and influenced by so many circumstances of fact, that it is difficult, often, to determine just what the result of a suit for damages, in which it is involved, will be. It is also true that, when a case actually arises, it must be left to the legal department of the road to handle. But, as prevention is better than cure, and the results of ignorance and negligence are altogether out of proportion to the amount of labor and care required to avoid them, it is certainly desirable that the officer in charge of the mechanical department of a road should understand clearly the relations in which it stands to the law.

It is the intention of this paper to present briefly and without legal technicalities the principles of the law on this subject as they exist to-day; and something of the future tendency.

It is not uncommon for an inventor or the promoter of a new invention to say: "The law will force railway companies to use my device; even if there is no special legislation for it, the courts will hold railway companies responsible for accidents which might have been prevented by its use; and, therefore, they must come to it." This kind of argument is constantly used in the endeavor to induce capital to invest in so-called improvements; and has, no doubt, led to much injudicious investment. At the other extreme are those railway officials who do not recognize the existence of any legal obligation except that which is directly expressed in statutory law, and forced upon their attention by strict and well-defined penalties.

The common law relating to the responsibility of carriers of merchandise and passengers, antedates the existence of railways. When the stage-coach was superseded by the locomotive, the general principles of the law relating to carriers remained the same, and were only changed so far as necessary in application to conform to the new conditions. The earlier decisions were inclined to hold railways to a higher decree of care than stage lines, because steam was considered a more dangerous servant than the horse; and the greater the risk the greater should the precautions be. In later times, the tendency to require greater care has been due to a recognition on the part of the legislatures and the public of the increasing comparative value of human life.

In the progress of civilization it is not improbable that this tendency will continue to grow until, ultimately, negligence may come to be considered synonymous with crime; and dollars and cents will not balance the scale against humanity. A world which has reliazed so much from inventive genius and expects so much from it will not tolerate any kind of obstruction to its full fruition.

There are two general divisions of injuries for which a railway company may become liable in damages—those to property and those to persons. With relation to goods received for transportation little need be said. Under the common law, the carrier is absolutely the insurer against all loss except from "act of God," (as by lightning) or the public enemy. In modern practice, the carrier limits the liability by special contract contained in the bill of lading; but he cannot avoid liability for his own negligence. The railway company has the strongest possible financial considerations for endeavoring to avoid injury to merchandise. The cases in which it can excuse itself for any loss or injury thereto are comparatively few.

Merchandise delivered to a railway company for transportation is wholly within the control of that company. Not so with passengers; they are endowed with reason and the power of locomotion. These powers they may exercise for their own safety or they may neglect to use to their own injury. A passenger may place himself in a position of danger, notwithstanding the greatest effort of the carrier to prevent him from doing so. Hence he must be held responsible for his own safety so far as it lies

within his power; and contributory negligence on his part will relieve the railway company from liability. But, aside from this, the carrier is held to a very high degree of care, not only in the operation of the road, but in the selection or manufacture and care of its machinery and all its appliances. The railway company does not absolutely insure the passenger; but it does insure him against all risks due to its own neglect.

It is in the interpretation of this word "neglect" that the gist of the matter lies. Various expressions have been used by the courts in defining the degree of care required of a carrier of passengers; and these have passed into the text-books of the law. It is said that the carrier is "held only to the utmost care of a cautious person;" that it is "liability only for want of due care, diligence and skill;" and that it is responsible "only as far as human care and foresight will go." These are general principles requiring further elucidation. The law does not require anything which is physically or morally impossible; nor a degree of perfection which may be ideal but is not practicable. It considers that the business of a railway is to furnish transportation, and does not require an expenditure and responsibility so great as to make the business impracticable. It also considers the position of a railway and does not require so much in the way of expenditure from a small road with light traffic as it does of a great trunk line. In other words, it follows the dictates of common sense in determining the exact meaning of the word "duty." These limitations, however, are not intended as loop-holes for escaping responsibility, and within these lines a strict account is held. In general terms it may be said that a railway company must be abreast of the times. In the construction of its machinery it must, in the first place, exercise the greatest care in the purchase of materials. The most approved tests must be used; and quality must be considered before price. It would doubtless be considered negligence for a railway company to purchase and use a wheel costing only seven or eight dollars, when the best expert testimony was that a good reliable wheel could not possibly be made for less than ten or twelve dollars. Such action would betray a recklessness which no court could excuse. It has been held that axles must be tested by the most approved methods in use, and that a railway company "must apply to boilers of locomotives every test recognized as necessary by experts." And this liability is not avoided by purchasing machinery already made, from manufacturers. The negligence of the manufacturer attaches to the railway company buying and using his machinery. Nor will the high reputation of the manufacturer avail the railway company as a defense.

The only exception to these rules is in the case of "latent defects which could neither be guarded against in the process of construction nor discovered by subsequent examination;" and this will be construed in the light of the highest scientific skill. Many defects which were once considered latent can now be discovered; the causes are known and can be guarded against. Such cases will be considered with reference to the "present state of the art"—ignorance of which is no excuse. So, when a machine or vehicle has been put in operation, continual watchfulness is required, and a cautious observance "of all accustomed and known tests for the discovering of their insufficiency, as often as circumstances require." In an interesting case, the tire of a driving-wheel had been tested when new; subsequently it was returned and not again tested. It was held that the neglect to make this second test rendered the railway company liable for an injury resulting from the breaking of the tire. The factor of safety must be sufficiently large to cover all the probabilities, if not quite the possibilities, and no chances must be taken.

We now come to the important question in how far a railway company is legally bound to adopt new inventions and improvements. The rule governing this subject has its limits; but within these limits it is one of great and growing importance. The courts are more and more inclined to hold carriers to a strict responsibility; and this is being supplemented to a considerable extent by legislative action. Generally speaking, a railway company is under legal obligation to adopt such new inventions and improvements in the construction of its equipment, as will conduce to the safety of travel. This does not, however, cover every possible device; nor any which are only theoretical or in the experimental stage. It is not obliged to experiment with everything which looks well, nor to accept the mere experiment and limited experience of others. Nor is it obliged to use any device which might accomplish its object in one direction, but at too great a risk or actual detriment in others. It must keep up—not with the very highest scientific skill, nor the most advanced flight of inventive genius—but with the actual and general mechanical progress of the times. The law requires the adoption and use of such inventions and improvements as are well-known and generally approved—as for instance, continuous power brakes; platforms which prevent telescoping; and many other devices which will readily occur. But there are always a large number of inventions in existence which have not been demonstrated to be successes, and concerning the value of which there may rightly be a difference of opinion. It thus appears that success is the criterion which the law applies; and that it is not in the earlier stages of the history of an invention that it is aided by this principle, but after it has really won practical recognition.

The same principle regarding the adoption of inventions applies to other classes of injuries besides those to passengers. Neglect to use suitable gates at crossings; valves for preventing the noise of escaping steam which frightens horses; spark-arresters for the prevention of setting fire to property along the track—will render a company liable, because such injuries are clearly preventable, within the limits of reasonable care and expense.

It will readily be seen, from what has been said, that the questions which arise, under our subject, are largely questions of fact as well as of law; and that the amount which a railway company will have to pay in damages in such cases will depend, to a considerable extent upon the degree of care, intelligence and foresight exercised by those in charge of its mechanical department.

In many States this principle has been to a certain extent defined by specific legal obligation in the shape of statutes—as for instance, by a law requiring the use of stoves in which the fire will be automatically extinguished in case of fire. Such statutes do no increase the common law liability; but reduce the question of fact to a simple issue.

The subject of injuries to employés is upon an entirely different basis from those which we have thus far consid-

ered. The employé is supposed to understand all the ordinary risks of his employment and to accept them. The employer is supposed to furnish good machinery and improved devices; but is not liable for injuries resulting from defects which were obvious to the employé. If the employé notifies the company of such defects and they are not remedied, it is his duty after a reasonable time to leave the employment. But if he is injured by some defect which is not obvious to him, and which the company should have known and remedied, he can recover. Except when otherwise laid down by statute, the employer is not responsible for an injury to an employé resulting from the negligence of a fellow employé. Questions as to who are fellow employés, and many others involved in those relations, have called forth numerous decisions.

But of late it has become quite general for railway companies to require employés to assume all risk, by the contract of employment. The law permits this except in the case of criminal neglect—a thing which is hard to prove. This virtually puts an end to damage suits on the part of employés; and has removed one principal inducement for a railway company to adopt certain classes of improvements. Employés generally are willing to assume the risk; and do not make any decided demand for the adoption of safety appliances. Their reckless disposition has been frequently illustrated. In one State where many brakemen had been killed by overhead bridges, a law was passed requiring the suspension of hanging straps across the road near the bridges, which gave warning to the brakeman by a slight blow. The brakemen began very soon to be annoyed by them and and to cut them off; and it was actually found necessary to protect them by making it a crime to destroy them. The law must sometimes step in to protect the improvident and reckless from themselves. Acting upon this principle, the legislatures of several States have lately passed laws looking to preservation of life and limb, by requiring railway companies to adopt automatic couplers. State railroad commissioners are also making investigations with a view to urging still further legislation of a similar character. Whether the desired end can be attained or even hastened in this manner may be a matter of doubt. But there can be no doubt that it is due to an existing public sentiment, and that the tendency will continue and increase. It can not be successfully resisted and opposition will only intensify it. Railway officials can only successfully meet it by such enlightened action as shall make it superfluous and altogether unnecessary. The mechanical officers of railways have been engaged in this work of improvement for years, with manifestly great results in certain directions. To a certain extent they have been hindered and embarrassed by the lack of coöperation on the part of those superiors, whom financial considerations are the only things which can influence. The requirements of the law may make themselves felt by boards of directors who are not inclined to listen to the arguments of those in charge of their mechanical departments. It may thus prove that properly directed legislative action will overcome existing obstacles, and really give an impetus to mechanical improvement, by clearing the way. If this be true, it is the part of wisdom not to antagonize the action of our legislators, but to endeavor to direct it into proper channels; and to place in their hands the most complete and reliable information on the topics which they are investigating.

CAR-INSPECTION.

THE conditions under which cars are exchanged from one road to another, though usually supposed to be settled by the rules, are actually in a most unsettled and unsatisfactory state to all concerned. Those who interpret them in a lax manner are no better satisfied than those who wish to apply them with the most rigid interpretation. Almost every car-builder sees his road subjected to unnecessary expense, delays and annoyances which are traceable in various ways to the exchange system and its abuses. Theoretically the exchange of cars under the rules is perfectly fair, and should be attended with no difficulties.

Regular running repairs are made by the roads on which the car happens to be when they become necessary, while the wheels are supplied at the expense of the owner, at a specified rate. This perfectly fair and simple method of conducting the interchange of cars is no longer possible. The rules which appear to cover all cases no longer do so. If they are enforced, as they frequently are, the penalty always falls on the innocent party. And what is of even more importance than the injustice, the traffic is interrupted and general managers have to interfere, and, at the risk of accident, forward defective cars over their roads. Not a few of the evils of car interchange arise from the diversity of opinion among car-inspectors. There are very few points at which there is a uniformity of practice, and it was at one time hoped that joint inspection would, to a great extent, remedy the evils of the system.

While this brought about a great improvement, there were many things much too deep to be reached by any convention of car-builders. The officers of the roads appear to be ignorant of the evils which have grown up under the system, and of the enormous expense which the abuses entail. The almost universal effort to get materials and supplies at the lowest possible figures, regardless of quality, has produced a result which, to say the least, was little foreseen by the purchasing agents or superintendents.

It has been repeatedly stated by persons connected with roads owning line-cars that their true policy in purchasing for the lines was to buy the cheapest cars which could be obtained, regardless of pattern, workmanship, strength or durability. This is a practical recognition of the fact that the cars are on foreign roads for the greater portion of the time, that the running repairs while at home are but a small percentage of the total which they require, and that of the actual repairing the owner pays for a small share.

The saving in first cost effected by the cheap and shoddy cars is a very large one. On a contribution of 500 cars to a line a saving of $50 per car represents $25,000. On foreign roads the repairs are made according to the rules. Cheap wheels are replaced by others which are good, at the standard price. Running repairs are made by the roads on which the cars happen to be without cost to the owners, even though these are many times greater than those of an honestly-built car. So great has the evil of poor wheels become, that some roads have seriously considered the proposition to buy the cheap $5.50 wheels for the purpose of replacing others of the same kind under foreign cars. This, however, does not meet

the case entirely. The owner of the cheap car saves the trouble and delay of renewing the wheels, and no small portion of the actual cost of running repairs, in addition to the interest on the capital which he would have otherwise expended.

In one sense the inspection, as at present carried out, is a failure.

The road which is dishonest or careless throws a heavy burden upon all roads with which its connnects. And unfortunately these roads have no means of retaliation. The same is true of roads maintaining an absurdly fine inspection.

By means of it they throw the bulk of repairs upon all roads with which they make connections. In a through line from West to East, composed of a dozen roads or more, there will be found a great variety of policy and practice in car repairs. Rather more than half may be classed as disposed to be fair. They are willing to keep their rolling-stock in a condition which makes it safe to run. There will be three or four that propose to "skin" and make only such repairs as may be absolutely necessary to keep their cars on the road. Lastly there will be one or two roads which will insist on fine inspection. Upon any system of roads thus constituted most of the repairs will fall upon those roads which wish to keep their rolling-stock in a fair condition. In addition to repairing, these roads must also burden themselves with the cost of transferring a vast quantity of "time" and bulk freight. The way in which this happens is very simple.

A road which cares very little for the condition of its rolling-stock forwards a lot of grain East in cars which are not fit to run, or which need serious repairs. Easy inspectors pass them along until they have half completed their journey, and a road is reached which calls for a fair inspection. They are, of course, cut out of the train and the load transferred. This is done at the joint expense of the roads meeting at the point where the inspection was made. The car is returned to the owners for repairs and the two roads have to pay the cost of transferring the freight.

This is but a small item and would cause but little complaint in itself. The exasperating feature is, that in due course of time, the same car comes back with another load, with its defects increased by the round trip which it has made. In hundreds of cases after loads have been transferred and the cars returned to the owners for repairs, the same cars have come back loaded but without the repairs, and the loads have been transferred four times in succession. In some cases a hundred cars out of five hundred have been marked for a transfer of freight. As long as these cars can be kept on the tracks they are sent forward loaded, and the repairs are at last made by other roads in self-defence,

The actual owners of the cars are not always most at fault in these matters, since the broken cars may be loaded by others and sent East. Another class of car makes difficulty at the point of fine inspection. This embraces those that are perfectly safe to run, but have minor defects. Two or three roads have inspected and hauled them in perfectly good faith, as the defects are not of a character to make the car unsafe. Reaching the road where a particularly fine inspection is insisted upon, these are thrown out. It very frequently happens that the transfer of freight has to be made by the company over whose road the car has come.

The question of close inspection is one which has many sides. In theory a large majority of car-builders are in favor of it, as it tends to greater safety. As practiced at the present time, it is eminently unjust. Wheels are taken out for hair-cracks in the plate which have evidently existed since the wheel was cast.

We have seen many wheels of this kind, which, from the wear of the tread, it is safe to say have made long mileages. Wheels are thrown out for cracks so minute, that to make inspection certain the cars would have to be turned upside down and the work done in broad daylight. The plea for inspection of this kind is, that it is conducive to the safety of the roads. While close inspection does, to a great extent, prevent accident due to the failure of rolling-stock, this is not always the reason for its adoption. Card a car and it will pass unquestioned with a defect which would otherwise have thrown it out as dangerous. For example, a car with a nut off from a bolster truss-rod, would be thrown out as dangerous if it was found without a card. We recently saw a car carded for this defect which had been in service four months. Cars are cut out for "bad ends" when the defect shows as a mere insignificant crack. We have seen a flat-car loaded with rails cut out because the load had shifted eighteen inches in handling and the rails projected nearly as far as the draw-head. This entailed handling on the part of the delivering road which was entirely unnecessary.

A counterbore is often marked as a loose wheel, and two half-cracks in brackets have thrown a wheel out. Oil coming through a porous hub is often mistaken for a loose wheel. Sand-cracks as old as the wheel itself have also caused rejection. We have seen a pair of wheels taken from under a car for cracks, which under a magnifying glass proved to be the remains of fins which had been broken off. Sometimes inspection has been carried so far as to reject cars coming home for repairs. The objection to be found with the very close inspection is, that it is not carried far enough, and is one-sided, and cars would pass a night inspector when they would be thrown out in the daytime. If it is to be applied at all, it should be adopted by all the roads. It must be applied intelligently and should be consistent. If one wheel is to be scraped and searched with a glass for old hair-cracks, all wheels must be treated in the same manner.

If a cracked bolster is unsafe to run without a card, it is equally unsafe with one. The excuse for using or accepting the card is to secure the road taking the car from the expense of the repair. This is true, but it is also true that if a wheel fails the owner will have to replace it. There are plainly other reasons for such critical inspections in some directions, coupled with laxness in others. The wheels with the hair-cracks do not open suddenly nor break without warning. Attempts have been made to show that this was the case, but we think the demonstrations have not been satisfactory. To inspect cars in the manner which many car-builders advocate is out of the question at the present time. No road in the country has its rolling-stock in such a condition as to warrant it, for traffic would be suspended and at many points practically stopped.

That it is desirable to keep cars in perfect condition is not to be doubted. This must be accomplished, however,

by the roads undertaking a thorough system of repair of rolling-stock, and then insisting upon rigid inspection at all exchange points. The exchange of cars and the system of repairing foreign cars calls for the most careful investigation from the superintendents of the roads. And it would be well if the through lines could come to some mutual agreement in regard to the exchange and repairs of cars which they could maintain. If one or two roads take a car in good faith and haul it the whole length of their lines, it should not be thrown out, upon delivery, if the defect has not increased.

The judgment of two experienced car-builders should settle the question, and cars which they have taken should be accepted as against the opinions of another who demurs on the ground of minor and perhaps trivial defects.

While joint inspection has done much to facilitate the exchange of cars, it has not remedied all the evils of the system.

It seems that it should provide some arrangement at the inspecting points, by which A should be prevented from receiving a car intended for B, but which B will not receive from A after the latter has hauled it the whole length of his line. In such a case the intermediate road has to make the repairs, which should fall upon the owners. For example, a road delivering cars to a road in the State of Massachusetts, may take, through a joint inspector, cars without a step, or lacking some of the particulars called for by Massachusetts law. Before these cars can be delivered, the repairs must be made by the intermediate road. In justice, such cars should have been turned back to the owners, or steps, brakes, etc., should be put on and charged to the owners.

The plan strongly advocated by some of the oldest car-builders in the country is to charge repairs of all kinds to the owners of the cars. Under such an arrangement cars would not be turned back for trifling defects. They would have the needful repairs made, which would be charged to the owners. The only exceptions to this rule would be in cases when the hauling road damages the cars through accident or careless handling. On the mileage basis, this plan would work no hardship. It would, if adopted, revolutionize railway rolling-stock, and would gradually bring it into first-class condition by making it the interest of every road to keep up its own repairs.—W. E. P., in *National Car-Builder*.

Railways in Belgium.

As regards mileage in comparison with area, Belgium to-day enjoys the premier position among the nations of the world. Per 1,000 sq. kilom. (620 miles) there are 85 miles of railways in Belgium, 57 in Great Britain, 39 in Germany, 30 in France, and 10 in the United States. A recent official report shows that there were 3,038 kilom. belonging to the state and 1,255 kilom. belonging to the companies on Belgian territory. To this *reseau* should be added 1,637 kilom. of accessory lines and station extensions, which make 5,931 kilom. (3,685 miles) of line in Belgium proper. If, again, there be added 215 kilom., the length of line owned by the companies in foreign territory, the grand total is 6,146 kilom. (3,817 miles). When it is remembered, says the London (Eng.) *Official Railway Gazette*, that Belgium includes but 11,369 square miles, it will be seen that the growth of her railway system is remarkable. The network of lines, for all the world like a cobweb, is as close and intricate as in the English counties of Lancashire and Yorkshire, so proximate are the busy towns and villages—Ostend, Bruges, Ghent, Brussels, Termonde, Malines, Antwerp, Tournay, Courtray, Tourcoing, Quiveron, Jemappes, Mons, Charleroi, Namur, Louvain, Liege, Verviers, Ypres, Jurbise, Luxembourg, Nivelles—all within an area less than one-eighth that of Great Britain. The State railway, which extends to Ostend, the principal seaport, runs from Brussels to the frontier of France at twelve points, to the Prussian frontier at one point, to the Luxembourg frontier at two points, and to the Dutch frontier at two points. The rolling-stock is extensive. To work these lines the State has 1,570 locomotives, 13 stationary engines, 3,006 passenger-cars, 691 baggage, mail and express-cars, and also 41,384 goods vehicles. On the companies' lines there are 533 locomotives, 818 passenger-cars, 449 other vehicles, and 13,915 vehicles for the goods service.

Contributions to a National Museum Illustrating Steam-Transportation.

MR. J. E. WATKINS, of Camden, N. J., who has recently been appointed Honorary Curator of the section of Steam-Transportation (Railroads and Steamboats) in the United States National Museum, in connection with the Smithsonian Institution, is authorized by the Institution to treat in the interests of the National Museum with any persons who may be willing to aid in the development of this section, and to add to the collection already in the Museum, objects illustrative of the history and growth of this industry in the United States. Specimens thus acquired will be exhibited in the Museum in the name of the donor. Mr. Watson has issued the following circular:

"In order that the collection in connection with this section may be made as complete and creditable as possible your coöperation is earnestly requested.

"The Pennsylvania Railroad Company has already presented to the Museum, Locomotive No. 1 (of the Camden and Amboy Railroad Company), more familiarly known as the "John Bull," together with a section of the original track, laid with some stone blocks, etc., upon which this, the oldest engine on their system, ran. Many other valuable relics from other railroads have also been furnished.

"I shall be glad to receive information as to the whereabouts of parts of such locomotives, cars, steamboats, track, etc., as may be of historic value, together with authentic drawings of early railway appliances, also old tickets, old time-tables, systems of old baggage-checks, etc.

"A nation which contains within its borders over 120,000 miles of railway, representing a stock and bonded capital of over 7,000,000,000 of dollars, should be zealous to preserve the history of the efforts of the pioneers in railway construction and equipment, which, during the last half-century, have had such an immense influence upon our growth and the development of our civilization.

"With this end in view the authorities of the National Museum have organized this section, by which they hope to perpetuate the history of the birth and development of

the American railway and steamboat, as well as to add an interesting and instructive feature to the museum, which is annually visited by between two hundred and three hundred thousand persons, hailing from every State and Territory in the Union, as well as from almost every nation."

English and American Railway Speed.

So many "Englishmen" have written to the New York *World* criticising its statements concerning the speed of English railway-trains, and asserting that their Irishmen, Scotchmen and Dutchmen averaged fifty miles an hour—some claiming a mile a minute—that a recent issue of that journal showed the relative speed of American and English trains, the actual time being taken from the official time-tables. The average speed of the "Flying Dutchman" is 36 miles per hour from the start at Paddington station at 11:45 A. M. to the finish at Penzance, 325¾ miles. From London to Exeter, 193¾ miles in 4¼ hours, it averages 45½ miles per hour, but from Exeter to Land's End it is only an "accommodation." The "Flying Scotsman" leaves the King's Cross at 10 A. M. and runs into Waverly station, Edinburgh, 396½ miles, at 7 P. M., an average speed of 44 miles per hour. Its first dash is from London to Grantham, 105 miles. Its second dash is from Grantham to York, 84 miles. The 139 miles are run in 3 hours and 55 minutes, an average of 48 miles an hour. After this spurt its speed drops to 40 miles per hour, taking 5 hours and 5 minutes for the remaining 207¼ miles from York to Edinburgh. The "Wild Irishman" averages only 40½ miles per hour for its short run. A train runs on the London and Brighton 50 miles in 1 hour and 10 minutes, or 43 miles an hour. The 400 miles at 44 of the "Scotsman" is not only inferior as a feat to the 1,000-mile run at 41 between New York and Chicago, but inferior to the Philadelphia express, which leaves Jersey City at 4:10 P. M. and reaches the Quaker City at 5:55 P. M.—90 miles in 105 minutes, or 51½ miles per hour. Short dashes at high rates of speed are common on American roads, and stories can be told by American locomotive engineers (when not under oath) that would make the hair of any one of their British brethren stand on end.

Proposed Tunnel from the Canadian Mail Line to Prince Edward's Island.

As one of the terms upon which Prince Edward's Island entered the Dominion, the Canadian government were to keep up a continuous communication between mainland and island, Winter and Summer. This part of the union the government has failed to carry out, and the British government has been appealed to. Senator Howland believes he has solved the difficulty, and has submitted to the Senate, plans and profiles of a scheme by which steam communication may be carried on all the year round by a system of tunneling such as now runs under the Clyde, Severn and Thames, and which has been favorably reported upon by Vernon Smith, C. E., well known in engineering circles in America and Great Britain. The total distance from Cape Tormentine to Cape Traverse, the two terminal points, is eight-and-a-half miles. Between these two points are the Straits of Northumberland. It is proposed to run a tunnel composed of metal cylinders three-eighths of an inch thick, 15 feet in diameter, lined with concrete two-and-a-half feet thick, giving a clear passageway at 10 feet, through which cars may be drawn by fireless engines; also to run piers out from the mainland on the New Brunswick side 10,000 feet, and from the Prince Edward's side 4,000 feet. To reach the bottom of the straits, which at the ends of these piers is 20 feet below water level, a cylinder will run down a gradual incline. Ventilation will be secured from a shaft sunk about half way across the straits, at which point the water is 90 feet deep.

Another Trans-Alpine Railway.

THE Arlberg Railway is scarcely opened for traffic when a new project for piercing another chain of the Alps is brought forward. The scheme applies to the Luckmanier, which, situated between the Upper Rhine valley and the basis of the Lake Tessin or Langensee, is not expected to offer any serious engineering difficulties. The railway would have to cross only one watershed, that of the Luckmanier (or, more correctly, the Greina), without having to surmount, as in the case of other Alpine railways, secondary watersheds. The length of railway proposed to be constructed, and joining Chur and Biasca, would be sixty-one miles. Its cost is estimated at between £4,000,000 and £5,000,000, of which between £3,000,000 and £3,500,000 would have to be expended upon the construction of a tunnel (thirteen miles long) between Surheim, near Dissentis, and Olivone, near Biasca. The countries most interested in the construction of the railway are, next to Switzerland, Bavaria and Central and Eastern Germany and Italy. It is urged in favor of the project that the St. Gotthard Railway has not answered the expectations formed of it, and could never do so, not having been constructed as a means of cheap communication and for heavy traffic, which, it is supposed, the promoters of the new scheme intend their railway to be.

Crude Petroleum as Fuel.

MR. A. J. STEVENS, general master mechanic of the Central Pacific Railroad, has devised a method of burning crude petroleum which he uses in the furnaces of steamers belonging to the road and for the stationary boilers in the shops. A heavy brick arch, not unlike the ordinary locomotive fire-box arch, is built in the furnace and the grate is covered deeply with a bedding of broken fire-brick. The petroleum is injected into the space between the arch and bed of broken brick, where it becomes gaseous, and meeting a supply of air, admitted by the proper appliances, is consumed. Two steam-jets, resembling injector-nozzles, force the petroleum into the furnace through the back of the shell. All the details for regulating the supply of combustibles and air are admirably arranged.

Respecting the apparatus Mr. Stevens writes the *Railroad Gazette:* "The apparatus works first rate. We are running our large ferry boat *Solano*, probably the largest boat of the kind in the world, and other steamers successfully with the fuel burned in this way. We are burning refuse or residuum petroleum, and we have not experi-

enced the slightest difficulty in keeping up steam, in fact we have much more steam now from the boilers than when we were burning coal. I do not know that to you there is anything particularly new in my arrangement, but I have never seen anything of the kind, and it seems to me that this apparatus is about what is required. We find the oil about 50 per cent. cheaper than coal. We can get up steam on a boiler with cold water in about thirty minutes, and the facility with which the oil is handled for fire makes the use of this kind of fuel very desirable on steamers. The fire can be entirely stopped or lighted in all the boilers in a few seconds."

New Prussian Railways.

THE Prussian Diet has been asked for grants for the extension and completion of the network of the State railways, to the extent of 60,700,000 marks (£3,035,000). Of this sum, 49,484,000 marks (£3,474,200) are required for the construction of fourteen new lines, of a total length of 587.4 kilometers (365 miles), and the balance for the completion of existing railways. Amongst the projected new roads, there are two main roads of a total length of 44.7 kilometers (28 miles), the cost of construction of which is estimated at 104,030 marks (£5,202) per kilometer, or £7,174 per mile, including the purchase of land; and twelve branch lines, of a total length of 542.7 kilometers (337 miles). The purchase price of land for the latter averages 5,650 marks, the cost of construction 68,000 marks per kilometer (£389 and £4,692 per mile respectively).

The End of the Suakim-Berber Railway.

THE building of the military railway from Suakim to Berber has been given up, on account of the abandonment of military operation in the Soudan. Eighteen acres of land adjoining Woolwich arsenal have been hired by the government for the purpose of storing the Suakim-Berber Railway plant, which is on its way back to England in thirty-two steam-vessels which are ordered to the Arsenal to discharge their cargoes. To facilitate the removal of the plant, a broad-gauge line is being constructed from the pier to the place of storage. The working of this line, which is about two miles long, presents a novel appearance, in consequence of the locomotives, carriages, stations, ticket-offices, etc., being painted with the words "Suakim-Berber Railway."

Locomotive Works in the United States.

THE principal locomotive works in the United States are as follows: 2 in Taunton, Mass.; 1 in Boston; 1 in Providence; 1 in Portland; 1 in Manchester, N. H.; 1 in Philadelphia; 3 in Paterson, N. J.; 1 in Pittsburgh, and 1 in Schenectady. The works in Philadelphia are the largest in the world, and are capable of producing 1½ to 2 locomotives per day. The works in Boston can turn out about 20 per month when running full. All the locomotive builders in this country are now running on short time. In addition to the works above named, many of the railways have shops of their own at which they occasionally build a locomotive to keep their men employed when no repairs are in progress. Prices of locomotives are only half what they were three or four years ago. A large freight or passenger-engine of the first class can be bought to-day for $6,500, againt $13,000 in 1881, and this would seem an excellent time to buy. The life of a locomotive varies from half-an-hour to a third of a century, but the average is probably fourteen or fifteen years. Some New England roads have engines twenty-five or thirty years in use for light work. The weight of a full-sized locomotive of the present day, with two pairs of trucks and two pairs of driving-wheels, is forty to fifty tons, and the size of the cylinder is 18x22 inches.

The Fate of an English Car in America.

TWENTY years ago, before drawing-room cars were introduced, an English compartment coach, elegantly decorated for those days, was built and run for a time on the steamboat train between Boston and Stonington. But it was never very popular. Americans do not care for that privacy which so many Englishmen insist upon, and they decidedly object to being locked up in a compartment, either alone or in company with one or two others who may be strangers. And so this palace-car of those days was soon taken off and was forgotten. But all these years it has been stored away somewhere by the Stonington Railroad, and at last it has been brought out, taken to Oakland Beach and converted into a café.

Cross-Ties on French Railways.

FROM the returns of the six great companies in France for the five years 1878–82, it appears that the average annual consumption of cross-ties amounted (on 12,720 miles average length of line, or 18,660 miles of single track) to 147 ties per mile of single track. Cross-ties of oak are the most common, constituting two-thirds of the whole number; beech constitutes one-fifth; pine and pitch-pine, about one-ninth; and lastly, fir, little more than 1 per cent. If an allowance of 25 per cent. of the total length of single track be made for sidings, the total amounts to 23,325 miles, and the consumption to only 118 ties per mile. The annual rate of consumption varies with the kind of wood used, but the average annual cost is approximately uniform at $145 per mile.

Iron cross-ties, which have been so extensively introduced in Germany and, to a small extent, in England, are as yet wholly in the experimental stage in France.

Death of Another "Oldest Engineer."

"UNCLE GAD" LYMAN, an old locomotive engineer, died in New York City last month, and it is asserted by his brother engineers, that he was the oldest locomotive engineer, not only in the United States, but in the world. His first handling of the throttle on a locomotive-engine was in 1839, on the Camden and Amboy Railroad. He was employed by the Rogers Locomotive Works, at Paterson, N. J., to take out engines. At the opening of the road to Binghamton he ran the special-train which took President Fillmore and his Cabinet to Washington. He worked on the Erie road for seven years, and left it to run an express-train on the New York Central. At the

commencement of the war of the rebellion he was appointed first engineer on the gunboat *Neptune*, and in August, 1865, received an honorable discharge. He was next employed on the New York and Harlem Railroad, where he had been ever since. Two years ago, in consideration of long and faithful service, he was assigned to the Port Morris branch for life, to do as he pleased. In all his experience of sixty years of engineering he never had an accident, and was laid up by sickness only three weeks. He was a member of the Brotherhood of Engineers from its conception, and up to his death was the chaplain of his lodge, 105.

Tie-Spacing.

WE think, says the *Journal of Railway Appliances*, that the time has come for seriously considering the question of tie-spacing, with a view of seeing whether or not the number of ties per mile could be decreased, with advantage to both the permanent way and the rolling-stock. We think that putting 3,000 ties per mile, or even only 2.640, is far too close work; that the rails should have more vertical stiffness and require less frequent support. Of course, this opinion will be regarded, at first, as nonsense, then as heresy, then as somewhat in advance of the times, and then it will be discussed, with due consideration. Within ten years the number of ties per mile in the track of our best new lines for high speed, will be reduced to below 2,500, and within twenty years to 2,000 or less.

Surface Crossing in England.

LEVEL crossing of railways by the highways are very rarely in use on English lines. The rails go over or under the public roads as a general thing. Where the crossing at grades does exist, English railway laws and customs demand the use of a gate worked in connection with the signal-box. A car-driver run over and badly injured at one of these level crossings, which was not provided with the usual gate, was awarded heavy damages, though it was clearly proved that the whistle was duly sounded, the judge ruling that the mere fact of whistling by an approaching train was entirely illusionary—that such whistling did not constitute necessary precaution. More in England than here, are the public protected by law and custom against "railway dangers."

Railways in Palestine.

MODERN railways are about to invade the Holy Land in several directions. Turkish capitalists have obtained concessions, and will build lines immediately from Alexandretta to Alleppo, along the bank of the Euphrates, and eventually to Damascus. The aim is to connect the Syrian sea with the river Euphrates, one of the most important highways of Asiatic trade.

A New Railway in Russia.

RUSSIA is about to begin a second railway between the Black sea and the Caspian, along the foot of the Caucasus on the north, while the existing railway is south of the mountains. Like the other Russian railways, it will be of five-foot gauge. The cost, with harbor improvements at Novorissik, is estimated at $9,500,000, or $55,000 per mile. The line will give an outlet to a productive grain country as well as to petroleum. The latter does not depend upon it wholly, as there is now a pine line sixty miles long leading from the wells to Novorissik. When built it will be possible to ride by rail all the way from the Atlantic to the Caspian sea.

Licensing Engineers and Conductors.

THE suggestion has been made that the various States should by law provide for the licensing of engineers and conductors, and that none but those who have received licenses ~~be~~ allowed to act as such. This would make an examination necessary and would tend to elevate these occupations more into a profession.

It is said that in Illinois a movement is progressing looking to the enactment of a law of this kind. If it has been found advisable or necessary in most States to require engineers in charge of steam-boilers to be lincensed, why, asks the *Railway Register*, should locomotive engineers be omitted? It is even more necessary for those in charge of passenger-trains to be competent men, than for those handling stationary engines in buildings.

The Largest Locomotive.

THERE is now nearly completed in the shops of the Baldwin Locomotive Works the largest locomotive ever built in America. It is intended for service on the Dom Pedro Segunda Railroad, of Brazil, and will probably be sent there this month. It is of the decapod class, with ten driving wheels, each 45 inches in diameter, and is mounted on a pony truck. The cylinders are 22 inches in diameter, with a 26-inch stroke. The boiler is 5 feet 4 inches in diameter, the fire-box 10 feet long and 43 inches wide, and the tender has a capacity for 3,500 gallons of water. The locomotive is designed for a gauge of 5 feet 3 inches, and will draw between 450 and 500 gross tons of cars and lading up a grading of 105 feet per mile. The wheels are so arranged that short curves can be rounded without difficulty.

SOME facts regarding railway freight are curious, as, for instance, it costs 4 cents per ton to unload tierces and 24 cents to unload light boxes. The chief reason is that one can be rolled while the other must be handled. Iron beams cost $2.05 per car to unload with tackle and $5.61 without. It costs 81 cents per car to unload rolls of leather, but $5.76 per car for loose sides.

THE new Forth Bridge, between North and South Queens Ferry, Scotland, approaches completion. It is a cantilever structure, 8,091 feet long, 150 feet high, and will cost $8,000,000. It has been nearly eight years building. Two thousand men are now employed upon it.

THE mileage of the Pennsylvania Railroad system is: Lines east of Pittsburgh, 2,178 miles; west of Pittsburgh, 2,629 miles; total, 4,707 miles. The American system having the greatest mileage is the Missouri Pacific, with 6,045 miles.

THE value of the rails imported into Italy in 1884 is officially returned at £573,046, as compared with £711,444 in 1883.

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Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

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MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

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THE ETHICS OF STRIKES.

THE pusillanimity of the West Division Street-Railroad Company, of Chicago, in dealing with the strike upon its road may be far-reaching in its disastrous effects. No earthly excuse can be offered by the Company for its cowardly surrender to the insolent demands of its employés, and the promised discharge of several of its capable officials at the word of a set of unreasoning road-hands, establishes a dangerous precedent.

In the question of strikes there is much to be said on both sides. The right to strike for higher wages is an inalienable right of the workingman in every capacity. To some extent, it is his only defence against the corrupt use of wealth and the grasping tendency of monopolistic organizations. If a railway underpays its men and requires of them more labor than it is willing to pay for, we say amen to an honest strike for higher wages or better treatment. But there is an honest strike and there is a riotous strike. The honest striker will, in concert with his fellow employés, leave work at a given signal and until a settlement is reached use all lawful means to coerce his employers. He will endeavor, and properly, to dissuade all other men from taking the position he left. He will endeavor to paralyze the business of his former employers through its entire cessation. This much he can do and do it lawfully. Doubtless, there are many capitalists who deem even this power to great a concession to labor, and would see it curtailed; but, thank God, the right of a man to set his own price upon his own work and to exercise his powers of persuasion to make others refuse to work at a smaller price, is still undisputed.

But there the power of an honest striker ends. The slightest attempt to injure the property of his former employer is a crime for which he should be made to suffer. The slightest attempt to prevent others from accepting the work he rejects, by threats, intimidation or personal violence, is an offence that should be punished with the utmost rigor. And yet intelligent men fail to comprehend the difference between a lawful and a riotous strike. They know what they want and deem their wants just; and so thinking, any means by which their ends are reached are considered justifiable. That is the argument advanced, and that is the opinion engendered and fostered by demagogue mayors and governors who angle for the labor vote.

And the pity of it is that the daily press as well takes that view of the case, and any attempt on the part of civil authorities to suppress the lawlessness of strikers, is denominated an outrage on the laboring man who is beslobbered with praise and courted as a member of a particularly privileged class. The press is quick to denounce Mr. GOULD, or Mr. VANDERBILT, or Mr. Anybody whose wealth gives him prominence, whenever any transaction

is entered into by them savoring of monopolistic greed, but the laboring man is a being who can do no wrong.

In the case of the Chicago strike a number of men were discharged by the railway company, and it was alleged as a reason for their discharge, that they had been prominent in forcing a successful demand upon the road for increased wages to its employés. Granted that this be true. Granted, also, that the railway company did a mean and ungenerous act when it discharged a few men who, by reason of their superior intelligence, acted as the leaders and spokesmen of their fellows. Granted, still further, that the fellow employés of these discharged hands pursued the only honorable course open to them in refusing to work upon the road until their spokesmen had been reinstated. What follows? Did the strikers or their friends and sympathizers acquire proprietary rights in the property of the road by their action? By their withdrawal from the service of the company, did they acquire a controlling voice in the operation of the road they were doing their best to injure? And must it be accepted as a truth that the unemployed form a labor congress whose express prerogative it is to say whom capital shall and shall not employ? Such, it would seem, are the natural questions arising from the results of the strike, and to these questions the strikers have boldly answered Yes; an answer received with applause by the whining, servile press. The cars of the road were interrupted in their travel, derailed and damaged, and the substitutes, who through necessity or lack of other employment had accepted the vacant places of the strikers, were subjected to personal insult and injury. And yet, when a police captain very properly clubbed the heads of a score of riotous strikers and their disorderly friends, he was accused of "brutality" and his eminently commendable vigor is stigmatized as a "bloody outrage." And after maintaining a bold front for a few days the road backs down and the insolent strikers are taken back, and the obnoxious persons who caused the discharge of the alleged leaders are dismissed from the company's service, and everybody is calm and peaceful again, the company happy in the thought that it has given its employés the right to dictate the most outrageous terms in the full confidence of their being granted, and the employés happy—and with more reason—in the knowledge that they have bullied the company in utter defiance of law and order, that public sympathy was with them, and that the company has acknowledged their bossism and placed itself under a yoke forever.

For once—just for once—we would like to see a reverse of the picture. We would like to see a combination of tradesmen—grocers, bakers, butchers and clothiers—fix the prices upon the necessities of life and declare that for less than that price the necessities of life shall not be sold. We would like to see one of their calling, in disregard of their action, undersell them and obtain the bulk of patronage from the working classes. We would then like to see the band of striking tradesmen attack both the disobedient seller and the high-handed buyers who had the audacity, the first to sell at any price he chose, and the second to buy where they can buy cheapest—to attack them, burn and destroy their property, and inflict personal injury. In that case would the public press extend their sympathies to the poor tradesmen who are making an heroic endeavor to "fix" the price of necessities, and at the same time, but in a different fashion, "fix" those persons who disregard their attempt and endeavor to pursue the even tenor of their way regardless of combinations of the sort? Ah, no! The case would be very differently handled; but then, these tradesmen are not "workingmen" and have not the special privilege of doing as they please, and interfering with other people's business and dictating terms with lordly mien. It makes a great deal of difference whose ox is good. And yet the cases are precisely alike. The insolence and outrage of the tradesmen would not be one whit the greater than the insolence and outrage of the striker.

THE RECENT CONVENTIONS.

LAST month was conspicuous in railway annals as the period of numerous conventions of railway associations, prominent among which—preëminent we may say—were those of the Master Car-Builders' Association and the American Railway Master Mechanics' Association An abstract of the proceedings of these two conventions would be of little service to our readers, and would in no way do justice to the organizations. In fact, to comprehend the entire scope of action of these two associations, and of others similar in character yet perhaps not attracting quite so much attention, an examination of the printed minutes is necessary, and while we shall endeavor to print the reports and papers submitted and read at these conventions, we shall omit the recital of the detail work which in due time will be made public in the minutes.

But in alluding to the subject we feel compelled to pay a just tribute to the associations both as to the nature of the work they carry on and also to the clear-headed manner in which it is performed. Yearly the conventions have increased in importance, and yearly the members have endeavored to give them more of a scientific than a social character. It is impossible that one hundred men, practical, intelligent, and whose calling is identified with the subjects under consideration, can meet and spend three or four days in the discussion of problems intimately associated with their profession without the railway world being the gainer, and the only fault we find with such

associations is that there are not more of them. Every department of railway construction and operation, from the highest to the lowest, affords an opportunity for study, and the discussion of the problems connected therewith infallibly will yield good fruit. Every year, fortunately, sees an increase in the number of such associations, and every year a palpable benefit is derived from the ventilation of practical questions by practical railway men.

EDITORIAL NOTES.

THE International Railroad Conference will meet in Brussels next month, and the United States will be represented thereat. While as a scientific study the results of the conference will be awaited with interest, it is doubtful if it will be productive of practical results. Railway methods vary too much among nations to hope for uniformity, at least for many years, and there are operating causes tending to render the subject of railway management peculiar and individual to each country. The conference will consider a number of questions and, in fact, almost too many. Fewer topics of discussion would allow of greater deliberation and consequent definite conclusions.

* * *

THE approaching Novelties Exhibition of the Franklin Institute, will offer an excellent opportunity for the display of novel railway appliances, which opportunity should not be neglected. The time for holding the exhibition has been fixed from September 15th to October 31st, and the railway exhibits are expected to furnish one of the most interesting features of the display.

* * *

THE death of Senator EZRA MILLER, of New Jersey, removes from us one of the most successful of railway inventors. The Miller coupler has stood at the head of such devices almost since its invention, and it may be demoninated as the first patent car-coupler that achieved marked success. The inventor acquired a fortune through it and yet, such is the inconsistency of man, while in the New Jersey Legislature he was classed among its anti-railway members. Despite his skill as a railway inventor, Mr. MILLER could hardly be called a practical railway man for he was an earnest advocate of a bill to reduce railway fare to a uniform rate of abont one mill per mile. Nevertheless, it can be said with truth, that by the invention of his coupler he has done as much as any man of his time in the interests of railways and of the traveling public.

* * *

THE special newspaper-train of the *New York World* has accomplished the feat of running from New York to Boston in five hours, and it is bragging somewhat of the achievement. Undoubtedly this time is a great improvement over the regular schedule time between those points, but the distance is only 229 miles, making the average speed of the *World* special but a little over 49 miles per hour. We trust the enterprising *World* will not rest content with this speed. Let their train run the entire distance of 229 miles in 229 minutes, and there will be something to brag about.

* * *

WILL the Baltimore and Ohio absorb the Philadelphia and Reading and the latter's leased lines? This appears to be the great question at present in railway circles. Should such be the result of the Baltimore and Ohio's efforts to get into New York it will accomplish two ends. First, a lively rivalry will be opened with the Pennsylvania, and two roads will be taken out of financial embarrassment.

* * *

AND now it seems Mr. VANDERBILT is going to secure control of the West Shore, and another bankrupt road will be absorbed. The railway magnate has stigmatized the West Shore as a "common, miserable thief," presumably beeause it paralleled the New York Central, but, apparently, it was all right for Mr. VANDERBILT to parallel the Pennsylvania Central. Trifling inconsistencies of this sort are not worthy of much attention, however. They are too common in railway management.

* * *

AT last the State Park at Niagara Falls is opened and the tourist can feast his eyes upon the most superb of Nature's handiworks without being subjected to all the miseries of extortion. The Niagara hackmen, it is presumed, are doleful, for they will no longer share the proceeds derived from the species of financial phlebotomy practised at every nook and corner of the Falls, but as by this time they are—or ought to be—all millionaires we need not waste our pity on them.

AMONG numerous interesting United States Consular Reports received from Washington is one of peculiar value at this time. It is entitled "Cholera in Europe in 1884," and gives a full history of the spread of the disease last Summer through Italy and Southern France.

CASSEL'S & Co.'S *Magazine of Art* for August is an unusually attractive number and is beautifully illustrated. Among their forthcoming publications, Cassell & Co. announce Lieutenant Frederick Sahwatka's "Nimrod in the North."

Appletons' Railway Guide and the *Travelers' Official Guide* for July appear promptly, chronicling the latest changes in railway and steamboat time-tables.

Outing continues more and more to place itself in active competition with the great monthly magazines. Its August issue is deserving of especial praise.

THE Montreal *Daily Witness* has published in pamphlet form, with numerous illustrations, the full history of the Riel Rebellion.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

STREET-RAILWAY INVENTION.

THE following has been sent us in good faith and we seize it as the text for an editorial sermon :

CHICAGO, July 1st, 1885.

Editor American Railroad Journal:

DEAR SIR.—I am an inventor and I would like to know in what way I could devote my energies to inventing appliances for street-railway use. Is there any particular improvement that street-railways need and have not been furnished with ? Can you kindly suggest an entirely new street-railway device that is needed and yet has not been furnished ? Hoping you will be able to give me some information that may be of use, I am,

Yours truly, B. M. C.

You ask if there is any entirely new device that street-railways need and have not yet been furnished with. We answer, yes. A great invention would be a car that would run itself without bothering with a motor of any kind. As yet no such invention has been furnished. Still again, a device for collecting the fares of passengers, stopping and starting the car, and ejecting boisterous persons and those who will not pay their fare, would be considerable of an improvement over the prosaic driver and conductor. Such an improvement has not yet been supplied. Still again, a device that would do away entirely with the use of rails would come in handy, as it were. No such device has been patented.

In other words, you approach the subject of street-railway invention tail foremost. Instead of seeking to improve old methods by inventing a new appliance, you "reach out for the infinite" and endeavor by one bold stroke to revolutionize street-railway operation in a previously indicated manner. Furthermore, you speak of being an inventor. We recognize no such profession and we spoke strongly to that effect in our last issue. You might as well call yourself an eater. A man eats when he is hungry, and he invents when he feels a need for an improvement, which need he is fortunately able to supply. There is no profession of invention.

Unfortunately you have approached the subject the wrong way. Doubtless there are a thousand improvements that can be made in street-railway devices, and we can name a number. There can be improvements in tractive power; in methods of heating and lighting; in brakes, in wheels, in rails, in the car itself; in devices for registering fares; in upholstery and decoration; in every department of street-railway construction and operation; but the only way for you to discover what is wanted is by a careful inspection of present defects, and then a careful application to overcome these defects in the simplest manner possible. No amount of ingenuity is going to help you if you assume that to produce a valuable street-railway invention you must produce something entirely new.

And you may console yourself with the reflection that you are not alone in attacking the subject of improvement, instead of courting it. Many street-railway managers seem actuated by the same spirit of reckless adventure, and before the actual needs of their roads have received attention, plunge into the concoction of theories that will revolutionize the business.

If you see any defect in the present methods employed by street-railways, set about finding a remedy and if you succeed you have got the best sort of invention. The field is a good one and a practical man has a chance to do a great deal in the way of improvement. We have indexed many features of street-railway operation that can be improved, and the way for you to improve them is to examine their defects. In the same way the truly progressive street-railway manager will first seek to perfect present methods before devising new ones. We are not overly conservative here in America, but we don't like "earthquake" improvements, and the less an improvement has that is new about it—its novelty being its sole merit—the more we are liable to appreciate it. This is a very homely truth that is as applicable to the street-railway manager as to our frieud the inventor.

THE Broadway Surface road is now in active operation and despite our anticipation it does not seem as if the traffic upon that thoroughfare has been impeded thereby, while the retirement of the omnibus has resulted in an decrease of noise and confusion along Broadway. Honestly we confess it, we were bitterly opposed to the construction of the road, but our ground of opposition has been proven untenable, and we cheerfully admit that it appears to be of public benefit and usefulness. But now that the ice has been broken and it is demonstrated that a surface road can be operated on Broadway without an entire paralysis of trade and commerce, can we not live in the hope of seeing cross-town roads in the lower part of the city? The large tract of the city below Walker street is divided by Broadway as by an impassable gulf, and the western and eastern sections are without means of intercommunication by street-railways. Apparently all that has prevented the construction of street-railways between the North and East river ferries has been the vexed

problem of crossing Broadway; but if a road can run through Broadway without detriment to its business interests, surely there seems to be no valid reason why several cannot cross it. At present there is active rivalry between the Fulton and Cortlandt Street Railroad Company and the Fulton, Wall and Cortlandt Street Railroad Company as to which shall have the privilege of constructing the first cross-town line in the lower part of the city. Arguments are now being made before the Board of Aldermen by representatives of the two companies, and the public have very little interest in the matter so long as one of the two is granted a franchise. The intended routes of the two roads are practically alike, and the construction of either would supply the city with a long-needed means of travel.

THE CABLE SYSTEM.

BY W. W. HANSCOM, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHILE this subject is receiving earnest attention from engineers interested in a proper development of the system and such modifications as must necessarily be made in the details to adapt it to different localities and for different climates, it is not, perhaps, inappropriate to allude to some of the plans which are put forth with the laudable desire of overcoming known objections and disadvantages. In some cases a mistaken theory prompts the eradication of some anticipated disadvantages, and a provision for such contingencies as are supposed, but do not really occur, or if at all at such infrequent times as to place them out of the category of derangements of great importance.

It is not right to expect that a system of street-car traction which has come into some prominence within five or six years, should be so perfect in its development that, without any modifications, it is adapted to any locality, climate or condition of traffic. It is neither just nor proper to expect everything from it, nor to condemn it as having no good qualities by which it may, under reasonable conditions, be of public benefit, and a financial success to those who may invest in its securities.

This system has proved advantageous, beneficial and profitable in San Francisco, first over lines too steep for horses, and afterwards, where horses had been used, it proved a much cheaper power than animals, over such length of road that the distance traveled by each passenger carried was not excessive. It being understood that a cable road might be of such length that if all the passengers traveled the whole length for a uniform fare, the operating expenses would equal the receipts, whatever number of cars were used at practicable limits of intervals between trains.

A sufficient number of cable roads have been built and are being operated under a diversity of conditions, to enable us to form an intelligent estimate of the probable cost of construction and operation when the conditions under which they are to be constructed and their requirements in operation are known. I mean that the cost of a proper tube, with superstructure and street work, with cost of motive-power, cars, grips, cable, etc., may be as definitely stated as any railway structure which may be proposed for any particular locality.

Enthusiasts may insist that any street in any city is a proper place to put and operate a cable road; but the same judgment is necessary and the same discretion required as in locating and constructing a railway in any part of the country. Because a cable road is successful in one locality, it does not follow that it must be so in any other locality. It seems hardly necessary to make this assertion, but there is as much variation in the cost of construction of cable roads as there is in the construction of steam-railways; and also as much variation in the operating expenses as in steam-railways. The same rules will apply in the one case as in the other, and any one who attempts to contravene natural laws by forcing conditions, must and will fail in the undertaking.

Because a cable road has been so constructed that it freezes up in Winter, it does not follow that one cannot be constructed that will not freeze; in other words, if the tube of the cable road in Philadelphia has been so ill-constructed that it has not sufficient back-bone to resist the action of the frost, it does not follow that all similar tubes must do the same. The Chicago roads seem to have been operated through as severe a Winter as ever Philadelphia is likely to have, and no such results have occurred as in the latter city.

While, in some instances, we may expect failures to accomplish all that is to be desired; yet these failures will serve to educate those who may follow, and lead to a more intelligent and careful consideration of plans for projected cable roads before they are adopted.

There is a mean between those who favor indiscriminate construction of cable roads on every street of any city, and those who oppose their construction on any street and, in fact, oppose the system entirely. There is a mean between the two where wise people will step in and construct and operate cable roads not only to their own financial benefit, but to the benefit of the community who accept and pay for their services.

Cable roads do not need to be hurrahed nor manipulated into existence for the pecuniary benefit of stock operators, but their own advantages are their greatest elements of power in inducing capital to be invested, when a reasonable condition in the wants of the traffic is shown, and favorable conditions for the operation of them in such localities and streets where the inhabitants desire them, are presented to the consideration of competent engineers.

In the April number of the JOURNAL extracts are taken from newspapers, one being from the *N. Y. Evening Post*, which seems to have a prejudice against the system of cable roads, although it may have been engendered by the wholesale attempts to cover all possible streets in New York City with cable roads, whether the system was adapted to particular streets or not. Some of the objections advanced by the *Post* are not based on experience and have no value among those who are acquainted with the facts in the operation of cable roads.

The *Post* says that machinery is not as intelligent as horses are, and, therefore, machinery should not be used. We would naturally infer that intelligence to design and construct would be sufficient to operate, and that man, who

has the knowledge, experience and judgment to construct machinery, would have sufficient ability to operate and direct it, to start and stop; but, according to the *Post*, after man has built a railway and constructed the cars for it, only horses have sufficient intelligence to move the cars, as they have an instict which prevents them from running over anybody and will turn one side. But the car—does that, too, go on or instinctively stop under such circumstances? It would seem that animal instinct is placed superior to human reason and intelligence. All street-cars are stopped by the brake, whether they are moved by horses or steam-power, and the brake is controlled by human intelligence through the physical ability of man; and whether the horses do turn one side or not to prevent running over a person, the car would continue on its way until stopped by the brake or some obstruction.

If the *Post* admits the fallibility of the grip-man in applying the brake with celerity, then allow some fallibility and contributory negligence on the part of the person who gets in the way of a coming car, or makes a mis-step in attempting to get on or off a moving car.

The stopping of street-cars is done by the brake, and the method of operating the brake is susceptible of improvement as is the brake on ordinary railway-trains. Air-brakes have already been applied to cable-cars and their efficiency is increased in a similar ratio to that between hand and air-brakes on steam roads. Thus the grip-man can now have the control of a whole train, and the increased momentum, alluded to by the *Post*, is absorbed by the increased brake surface in contact with the wheels of every car whether there be only the grip-car or a train consisting of three or more cars.

The writer has applied air-brakes to cable-cars and dummy, and they have been found ample to stop and hold a train on a down grade of one in eight, or 660 feet to the mile, so that their ability is beyond question on a comparatively level street, such as many are in New York City.

Experience in San Francisco has taught drivers and pedestrians that the grip-men can handle the cars much more promptly with the cable and brake than where horses are used, and the drivers of trucks do not, in fact, give the cable-cars a wide berth as the car is under better control than any truck hauled by horses, notwithstanding the statement of the *Post*.

While fair criticisms are in order, the arguments in vogue in the early days of railways should not be employed, nor assertions made that are daily and hourly disproved. It is to be hoped that the cable system will be developed under intelligent and competent engineering ability, and not by scheming or manipulating stock-companies that may be formed; and that cable roads may be constructed and operated in such localities as are favorable, to the increased comfort and convenience of the traveling public.

Street-Car Motors.

EVERY day the demand for an acceptable street-car motor becomes more apparent, says the *American Machinist*. Against motors so far tried there have been more or less objections, but to the observer it hardly seems that any of them have been tried with very much persistency. Many objections to something so much of an innovation as the doing away with horses on street-cars, are simply prejudices which a reasonable amount of persistence would overcome. If it were not for the fact that it is so easy to fall back upon the use of horses, no doubt a motor entirely acceptable would have been found before this; but it seems to be easier to go back to the old method than to persevere in overcoming the difficulties that may be expected in the way of the application of any motor. There is a place for a motor that is just right, but the owners or officers of the street-roads have so far shown but little patience in their trial; they expect impossibilities in the way of something that shall be just right at the first trial. An electric motor for street-roads would seem to possess special advantages, but does not seem to receive much attention. The first successful motor for this purpose that is placed on the track will have an important start in the race. In the meantime, unless there is more activity in the matter, wire cable propulsion may be improved until the introduction of any motor will be more difficult than at present. Important improvements are believed to have been recently made in cable roads, and perhaps with others to be expected it may be found the most desirable means of operating surface roads. However this may be, it is reasonable to suppose that horses will not always be used for the purpose.

Failure of the Philadelphia Cable Road.

THE Philadelphia Cable road is constructed through twelve miles of the principal streets of the city, and has cost the projectors $600,000; but it is estimated that $1,250,000 more will be required to correct mistakes. When the iron conduits through which the cable passes were laid, iron rods were run through the stringers and bolted to the top of the conduits just below the slot where the grip passes down to the cable under the street. Every change of temperature has been found to affect the width of the slot and hinder the passage of the grip.

The Broadway Surface Road.

DURING the few weeks in which the Broadway Surface Road has been in operation the traffic has been very large, and the ultimate profit of the owners is assured. Some rather extravagant estimates as to the extent of these profits have been made, one being as high as $1,000,000 per annum, but with a fair discount for exaggeration it is evident that the owners of the road will realize handsomely upon their investment.

So far the operation of the road has not acted detrimentally on the street-traffic, and there have been no serious blockades as prophesied. On the contrary the cars seem to act as traffic-guides and there is less obstruction than formerly, while the abolition of the omnibus has greatly lessened the noise and confusion on New York's principal thoroughfare.

The new cars will shortly be placed upon the road, and they are promised to be handsomest street-cars in the city. They will be a few inches narrower in the body than the ordinary car to allow for a contraction of the space between the tracks.

Switches are being built in the road near the Post-office, which are intended to do away with the old

Bleecker street car-tracks through Crosby, Elm, and Centre streets and Park place, which will be abandoned entirely. The Bleecker street cars coming down will switch into Broadway at Bleecker street, and continuing down Broadway will swing around the Post-office apposite Ann street, and run up Park place to Beekman street, and through Beekman street to the East River. Going up town the Bleecker street cars will continue along the old route through Ann street, will switch into Broadway opposite the Astor House, and continue on up to the switch at Bleecker street, whence they will travel on the old tracks.

Trying a New Compressed-Air Car.

IN Astoria, one of the suburbs of Brooklyn, a trial was made a few days since of driving a street-car by compressed air, according to the system of Robert Hardie. The car was built by the John Stephenson Company, and fitted up with compressed-air chambers to run a small motor or engine on the front platform, the air-chambers being under the car and car-seats, and wherever there was spare room. This capacity was said to be sufficient to run the car ten miles, the rate of motion being very efficiently controlled by an air-brake.

Electric Railway Progress.

ELECTRIC railways, which seem to be slow of introduction on this side of the Atlantic, according to the *Popular Science Monthly* are multiplying in Europe, and thus far they bear the test of continued use remarkably well. English papers bring us reports of six months' operation. of such a railway at Brighton. The mileage run by the cars amounted to 15,600 miles, and the number of passengers carried was about 200,000, or all that the car would accommodate for the greater part of the time. The dynamo is run by a gas engine, which has consumed 300,-000 cubic feet of gas. The total cost of traction—interest and depreciation on engine, dynamo, and motor, cost of gas oil and attendance—has amounted to $3.85 per day 100 mile run, or less than four cents a mile. The car service has been stopped for only one day, through the tires of the wheels giving out owing to the heavy pressure of the holiday traffic; there being at the time no second car available. On the whole, this is a very satisfactory showing for a system which is as yet only in its infancy.

,A Fireless Street-Car Motor.

EXPERIMENTS have recently been made in New Orleans with a machine for street-railways, the motive-power of which is obtained by evaporating ammonia after liquefaction, and has met with success so far. It is to be put into actual practice shortly on one of the surface-roads of that city.

An Electric Railway Test.

PROFESSOR SHORT, of Denver University, gave another public test of his electric railway on June 1st, at Denver, Col. The track is an ellipse 300 feet around, with a grade at one point of 250 feet per mile. The car made 7,300 feet in twelve seconds, with ten passengers; a rate of about 17 miles per hour.

The "Grip" Applied to Electric Railways.

A GRIP system of electric railways is proposed, in which the electric conductor or conductors shall consist of rigid rails firmly affixed to insulating supports, in a trench similar to that of the cable roads. Connection is made with these rails by means of roller contacts in such a manner that in ascending a grade, pressure may be applied between the car and the rails so as to give the car a greater pulling capacity, the pressure taking the place of weight in a locomotive.

Popularity of Steam Tramways in London.

THE steam-engines on the North London tramways are in great favor with the public. As an instance of this, it may be mentioned that the takings in one day on the steam-cars amounted to just double those on the horse-cars, although running alternately on the same line.

STREET-RAILWAY NOTES.

LICENSE of incorporation has been issued to the Inter-Municipal Elevated Railway Company, of Chicago, the capital stock being $1,000,000. The charter of this road gives it a right to build from the center of Chicago to Hyde Park, Lake View, Ciero, Jefferson and Lake.

THE John Stephenson Company are building a number of new cars for the Brooklyn (N. Y.) City Railroad. They are also building cars for a number of American roads and also for Mexican roads, and for a street-railway in Lisbon, Portugal.

THE new owners of the West End and Atlanta street-railway of Chicago, are now figuring on the cost of an extension to Westview cemetery. It is highly probable that the line will be completed to the cemetery before fall opens.

STEAM-MOTORS, each weighing 3,500 pounds, have been adopted by the Street-Railroad Company of Concord, N. H. Each motor is calculated to pull one car and make a speed of fifteen miles an hour where permissible.

HON. G. W. ALLAN, president of the Kingston Road Tramway Co., of Toronto, Canada, has agreed to state a figure at which the company would be willing to sell out their rights and privileges to the city.

IT is stated that the cost of the iron work of the Brooklyn Elevated Railroad erected was 3.22 cents per pound. The lowest contracts on the New York roads was 3.4 cents.

THE Birmingham (Ala.,) Street Railroad Company are determined to extend their line to Oak Hill Cemetery, which will give them four miles of track to the city.

THE Atlantic Avenue Railroad Company, of Brooklyn, N. Y., intend building a stable for their new Bergen street line at a cost of $50,000.

THE rails of the street-railway at Leesburg, Fla., have been laid as far as the Grand Central Hotel from the Florida Southern depot.

THE Louisville (Ky.) City Railway Company have just completed ten miles of new road, and are having twenty-one new cars built.

A NEW street-railway has been built in Galveston, Texas, by the Gulf City Street-Railway and Real Estate Company.

New Inventions.

Sax's Car-Weeel.

JOHN K. SAX, of Pittston, Pa., is the inventor of an improved car-wheel which is herewith illustrated and described. The object of the invention is to secure an effective union of the body portion and rim or tire, without expensive forgings in the construction of the latter, and also to avoid the objections incident to the employment of rigid wheels.

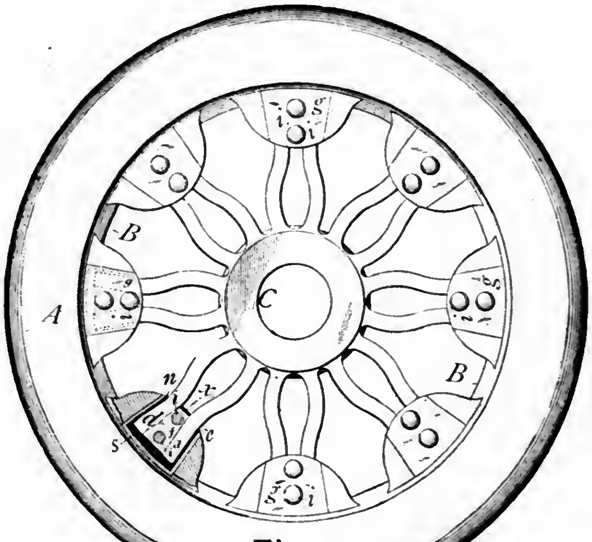

Fig. 1.

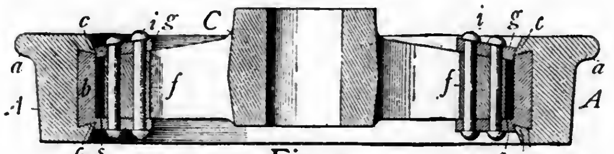

Fig. 2.

SAX'S CAR-WHEEL.

In the accompanying cuts, Fig. 1 is a side view of the improved wheel with parts detached and other parts in section, and illustrating one mode of constructing the body portion; Fig. 2 a transverse section of the wheel shown in Fig. 1; Fig. 3 a view showing a modification, and Fig. 4 a cross-section of Fig. 3.

The rim A, of the wheel may be of steel or iron, and may be cast or hammered or rolled into shape, and is provided at one outer edge with the usual flange *a*, and at the inner side with a continuous dovetailed recess or with a series of dovetailed recesses at equal distances apart, formed by parallel flanges *c c*, arranged at the opposite edges and with inclined inner faces, as shown. The inner rim B, consists of cast metal, which is cast in contact with the outer rim A, so that a portion or portions *b*, of the inner rim, will enter the recess or recesses in the outer rim, the two parts being fused together, and to this inner rim is detachably connected the body C, of the wheel.

In the manufacture of the wheel the outer rim or tire is first made, and then the mold in which to cast the inner rim is prepared, this mold being provided with an annular space to receive the outer rim, and with a space, or spaces or recesses corresponding to the form of the inner rim or section. The outer rim is then suitably heated, placed in proper position within the mold, which is then closed, and molten metal is poured into the mold, thereby casting the inner rim in direct contact with the outer rim, causing an intimate welding or fusion of the two together, so as to form, practically, but one part.

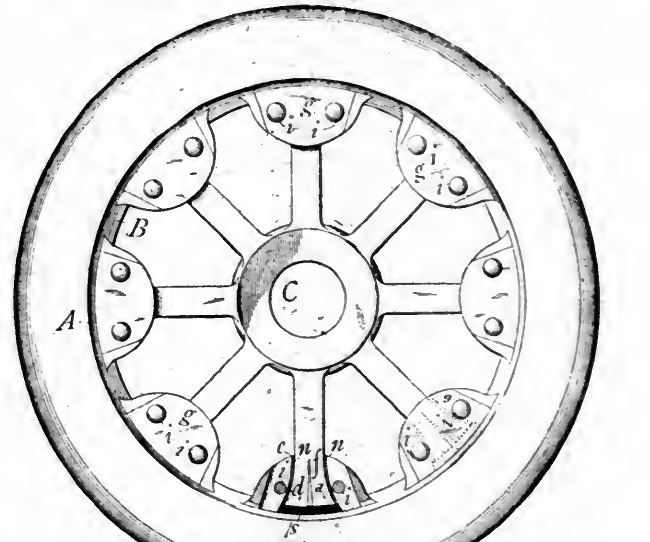

Fig. 3.

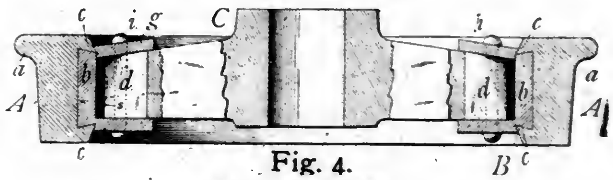

Fig. 4.

SAX'S CAR-WHEEL.

The inner rim is provided with recesses adapted to receive the outer portion of the body, and with cap-pieces between which and the inner rim such portions of the body are clamped. The body or center may be either a continuous plate or plates, or a hub provided with solid or divided spokes, as shown in Figs. 1 and 3. When the center is provided with spokes, the latter having flaring or expanded ends, the recesses or sockets *x*, in the inner rim are adapted to receive such ends, but are somewhat larger than the latter, and are covered by the cap-pieces *g*, which may be secured in position by bolts or rivets *i*.

When the spokes are solid, they are split to form two contiguous fingers *d d*; but when they are divided or consist of two contiguous bars, as shown in Fig. 1, the ends of such bars form the fingers, which are bent outward to constitute the desired expanded ends. In either case there are recesses *e*, between the sides of the fingers or ends of the spokes and the adjacent sides of the recesses *x*, in which are inserted rubber or other elastic packings *n*, and wedges *f*, are driven between the fingers *d d*, so as to separate the latter and compress the packings *n*.

As the ends of the spokes do not extend to the ends of the recesses *x*, there are left spaces *s*, in which are inserted packings or fillings of rubber, oakum, wood, or other suitable material, after which the cap-pieces *g*, are applied, so as to clamp the ends of the body portion firmly to the inner rim.

The inner rim or section may consist of separate pieces, each fused at one point to the tire or outer rim; but it is preferable to make the inner rim of one continuous annular piece adapted to a continuous annular groove within the outer rim, the side flanges *c c*, of which afford wide bearings, resisting any thrust tending to displace laterally the outer rim or tire, and imparting greater strength to the latter portion of the wheel. The groove formed by the flanges *c c*, while preferably dovetailed, may have parallel or outwardly-inclined sides or edges, the two rims being so thoroughly fused together as to form, practically, one piece, rendering the dovetailing unnecessary, except to insure connection in case the weld should be defective at any one point.

By making the sockets or recesses for the reception of the edge or ends of the body portion, of cast-metal, the body may be fitted to the rim of the wheel with but little expense, while by fusing the cast-metal section to an outer rim of forged metal the advantages are secured of using the latter without the expense which would result from forging the entire rim with recesses adapted for connection to the body portion.

By providing the rim with the recesses adapted to receive the edge or ends of the body portion, and by compressing packings between the two and securing them by means of detachable cap-plates, great elasticity is secured and a secure connection of the parts, with ability to disconnect them whenever it may be necessary for repairs or repacking.

It is the intention of the inventor to grant licenses under his patent.

Haskell's Time-Recording Apparatus.

CHARLES S. HASKELL, of Philadelphia, Pa., is the inventor of a time-recording apparatus which is herewith illustrated and described. It is principally designed for registering the hour of arrival and departure of employés in factories and shops, and in this connection is applicable to railway use. An automatically-operating device is provided adapted to record both the name of the employé and the hour of his arrival at work. The apparatus is conveniently applied within the case of a clock, and is provided with a scroll of paper or kindred fabric, upon which the employé upon his arrival writes his name, and with a lever or handle which, after writing his name upon the scroll, the employé is required to move, with the result that, through suitable mechanism, the movement of the handle is communicated to a printing or embossing device, so as to effect the recording of the hour and minute of the throw of the handle in connection with the name written upon the scroll.

In the accompanying cuts, Fig. 1 is a side elevational and partially sectional view of the apparatus, the side of the casing being removed, exhibiting the type-disks and the devices for actuating the printing-mallet and for causing the travel of the scroll of paper; Fig. 2 a front elevational view of the same parts, the front face of the inclosing-casing being supposed removed; Fig. 3 a front elevational view of the apparatus complete, or as it appears when set up for use; Fig. 4 a rear elevational view of the same, the back of the casing being broken through, in order to exhibit the ratcheted wheel a^x, counterbalanced pivot pawl, and connecting-bar to the lever-escapement; Fig. 5 a detached elevational detail representing the normal position of the mallet and mallet-carrier, the actuating-bar, and the dog, when the above parts are at rest and before the handle is thrown to start them into action; Fig. 6 a similar view, indicating the position of the parts at the moment when the dog is at the limit of its upward movement, and at the moment when the spring of the actuating-bar has caused the engagement of the dog with the notch in the bar; Fig. 7 a similar view of the same parts, indicating, however, their position when the dog has about half completed its downward movement under the influence of its spring, and has almost unseated itself from the notch in the bar; Fig. 8 a similar view of the mallet and mallet-carrier and upper portion of the actuating-bar, representing the position of the parts when the upward travel of the bar has caused the partial upward movement of the mallet and the partial unseating of the upper extremity of the bar from out the notch in the mallet-carrier, and Fig. 9 a view similar to Fig. 8, representing, however, the mallet at the top of its throw and the actuating-bar unseated from its notch in the mallet-carrier, and in the act of moving up to its extreme uppermost position, which it is represented as occupying in Fig. 5.

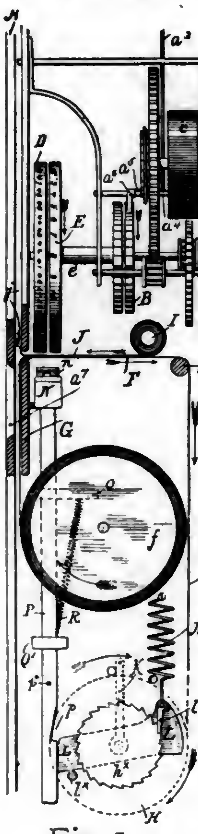

Fig. 1.

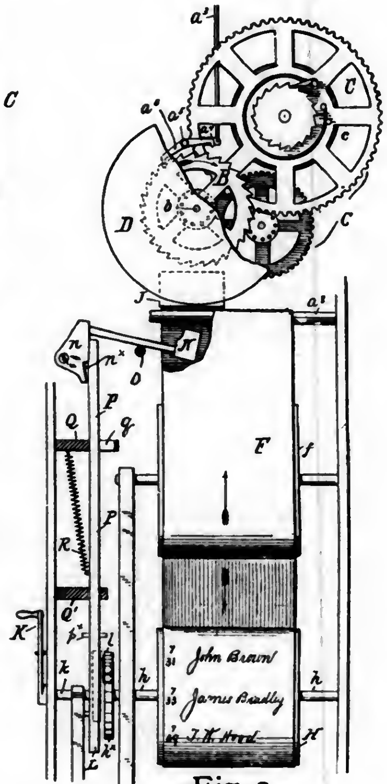

Fig. 2.

HASKELL'S TIME-RECORDING APPARATUS.

A represents the inclosing-casing of the apparatus, in the upper portion of which is secured a clock-movement of any preferred description and provided with any preferred motor. A description of this movement, which may be employed in conjunction with a clock-face and hands *a*, as shown in Fig. 3, is unnecessary, except in so far as to say that the movement is provided with a ratcheted wheel a^x, provided with, for instance, thirty teeth, and connected with the clock-work in such manner as to

be caused to make one complete revolution every hour. This ratcheted wheel, which is exhibited in Fig. 4, revolves in the direction of the arrow upon it, and in so doing occasions the movement of a counterbalanced pivoted pawl a^2, to which is secured a connecting-bar a^3, which latter at its lower extremity is connected to a rocker-arm a^4, mounted upon a rock-shaft a^5, which is provided with a lever-escapement a^6, the pallets of which alternately, in the throw of the escapement under the influence of the rocker-arm, connecting-bar, and counterbalanced pawl, engage the teeth of a ratcheted escapement-wheel B, supported upon an arbor *b*, and so connected with a clock-

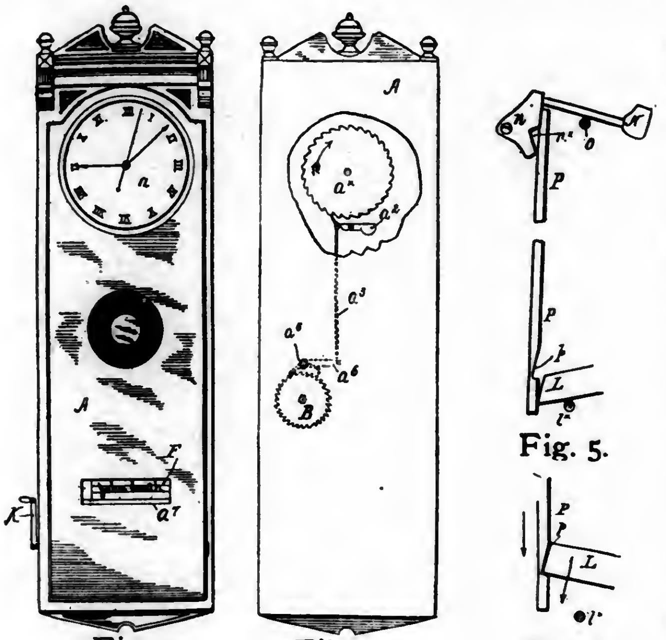

Fig. 3. Fig. 4. Fig. 5. Fig. 6.

HASKELL'S TIME-RECORDING APPARATUS.

work or other train of gearing C, actuated by a coiled band-spring *c*, or other motor, as to revolve once in an hour. The arbor *b*, which is journaled within the casing in a position at right angles to its face, is also equipped with a minute-disk D, the periphery of which is provided with numeral-types in a series of from 1 to 60. The operation of the lever-escapement permits of the actuation of the train of the gearing C, under the influence of its motive spring *c*, to occasion the rotation of the escapement-wheel and minute-disk once in an hour. Parallel with the minute-disk is an hour-disk, being a disk of the same diameter as the minute-disk, the peripheral face of which is also provided with numeral-types, numbered successively from 1 to 24. The hour-disk is mounted upon an arbor *e*, and so connected with the train as to be revolved ahead one peripheral space or number at the commencement of each hour.

The disks D and E, are simply printing-disks, and it is obvious that if a scroll of paper or other prepared material be pressed against a given point in the periphery of the disks simultaneously, and a printing-ribbon be interposed, the imprint of the numerals presenting at the points of contact will be impressed upon the scroll.

F is a scroll of paper, which is wound upon a paper-barrel *f*, housed in the casing, with its shaft parallel with the face thereof, in such manner that the scroll can be unwound from the barrel in the direction of the arrow in Fig. 1 on the barrel, and led upward parallel with and behind the face of the casing across what is a "writing-board" G, which latter is supported in the casing to the rear of a slot a^7, formed in the face of the casing.

The paper is led over the upper edge of the writing-board, and backward about a directing-roll a^8, and downward, and then about a winding-drum H, which is mounted upon a shaft *h*, and adapted to be actuated as explained hereafter.

I is a winding-shaft journaled in the casing, upon which is wound a printing-ribbon J, which is carried forward on

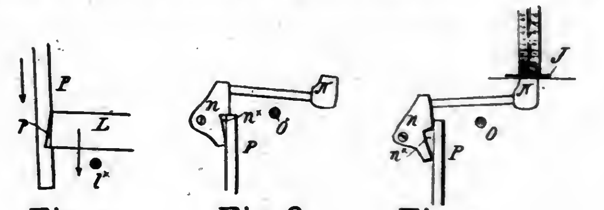

Fig. 7. Fig. 8. Fig. 9

HASKELL'S TIME-RECORDING APPARATUS.

top of the scroll of paper, and immediately beneath the lowermost portions of the minute and hour disks, and is secured by a suitable fastening *j*, with the casing. It is obvious that if the scroll of paper at a point beneath the disks be pressed upward against the disks, the numeral-types on the respective disks presenting at the lowermost points of their peripheries will be caused to leave their impress upon the scroll of paper by the action of the printing-ribbon in a manner well known.

K is a handle mounted exterior to the side of the casing upon a handle-shaft *k*, journaled in axial alignment with the shaft *h* of the winding-drum, and L is a dog mounted upon the inner extremity of the handle-shaft *k*, face to face with the ratcheted disk h^x. This dog is slightly angular at its front extremity, and at its rear extremity is provided with a dog-pawl *l*, which depends in such position as to be in engagement with the teeth of the ratcheted disk h^x. A spiral spring M, connected at one extremity with the casing at a point above the dog, is at its lower extremity connected with the dog, so that its ordinary tendency is to keep the dog in contact with the stop l^x, (Fig. 1,) fixed to the casing. N is a printing-mallet connected with a mallet-carrier *n*, pivoted within the casing. This mallet-carrier is provided with a notch n^x, for the upper extremity of the mallet-actuating bar. P is the mallet-actuating bar, it being a rod housed in bearings Q Q', provided near its lower extremity with a notch *p*, and also provided with a stop-pin *p*, adapted to engage beneath the bearing Q'. R is a spiral spring connected with the upper bearing of the actuatingba-r, or the other fixed point of connection, and connected also with the actuating-bar, this spring being in its connection suspended at an angle such as to cause it to act upon the actuating-bar in two directions. In the normal set of the devices the bar occupies the position represented in Fig. 5 with respect to the notch n^x, in the mallet-carrier, while the dog occupies the position represented in Fig. 5 with respect to the notch *p*, in the actuating-bar. In this position of parts the mallet is down against a stop-pin O, and the forward extremity of the dog is also down against its stop-pin l^x, as represented in Figs. 1 and 5.

The operation of the mallet or the stroke of the same for the purpose of imprinting the types upon the type-

disks upon the scroll of paper, is occasioned by the rearward throw of the handle K, which the workman is directed to make upon his arrival, and after he has first written his name upon that portion of the scroll which presents through the slot in the front of the casing. After writing his name the throw of the handle occasions the throw of the dog from the position which it is represented as occupying in Fig. 5 up to that shown in Fig. 6, a movement which permits the spiral spring connected with the actuating-bar to throw the notch in the bar into engagement with the dog, as shown in Fig. 6, and which also occasions the extension of the spiral spring connected with the dog, and, through the pawl upon the dog and the ratcheted disk on the shaft of the winding-drum, causes such sufficient rotation of the winding-drum as will draw that portion of the scroll of paper which has the name written upon it from its position abreast the slot a^7, in the casing, to a position beneath the type-disks. The release of the handle will then permit the spring M, connected to the dog, to contract and deflect the dog, the pawl of which slips over the ratcheted disk, so as to be without influence upon the winding-drum, the deflection of which dog is accompanied by the downward throwing of the actuating-bar and the extension of the spring R, connected therewith, until such moment as the continued rotation of the dog has caused its unseating from out the notch p, in the actuating-bar, as shown in Fig. 7 and 5, whereupon the bar, which in its downward movement has become, by reason also of the influence of its spring R, engaged as to its upper extremity with the notch n^x in the mallet-carrier, is, under the influence of its spring R, caused to fly rapidly up and throw the mallet-carrier and mallet up, so as not only to occasion the printing of the paper with the numbers presenting upon the disks at points abreast the name written upon the scroll, which numbers record the then time of day, but also to occasion the unshipping of the upper extremity of the actuating-bar from the notch in the mallet-carrier, by reason of the altered position of the mallet-carrier, which necessarily brings to pass such result, and which which will be understood by a reference to Figs. 8, 9, and 5.

It will now be understood in what manner the spiral R, connected with the mallet-actuating bar, and which is, of course, of less energy than the spiral M, connected with the dog, operates in the first instance to draw the actuating-bar in such direction as to cause the engagement of its notch with the dog, and in the second instance to cause in the downward movement of the bar the engagement of its upper extremity within the notch in the mallet-carrier.

The play of the upper extremity of the mallet-actuating bar is permitted by providing the upper bearing Q, with a slotted opening g. It is obvious that if the printing-ribbon be dispensed with, the mallet will cause the embossing of the scroll by the types upon the disks.

The contrivances for actuating the mallet and shifting the scroll of paper may be modified by the employment of a pressing or pulling-button, instead of a handle, and a lever and link connection may be used to effect the movement of the mallet and the travel of the scroll. The device could also be as well made in a separate case and connected with the clock by an electric wire, so that in large factories there could be one at each entrance, while in railway shops it could be connected with the electric clock system.

Zimmerman's Car-Coupling.

Christian H. Zimmerman, of Burbank, O., is the inventor of a new car-coupling which is herewith illustrated and described. The invention is controlled jointly by the inventor and by Chas. W. Weiser, of the same place, to whom one-half of the patent-rights have been assigned.

In the accompanying cuts, Fig. 1 is a longitudinal vertical sectional view of the car-coupling; Fig. 2 a transverse vertical sectional view taken on the line $x\ x$ in Fig. 1; Fig. 3 a transverse vertical sectional view taken on the line $y\ y$ in Fig. 1; Fig. 4 a perspective view of the draw-head and the front end of the car; Fig. 5 a detail view in

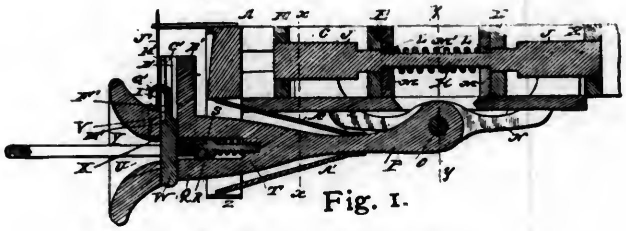

Fig. 1.

ZIMMERMAN'S CAR-COUPLING.

perspective of the coupling-pin used in connection with the coupling; and Fig. 6 a horizontal sectional view of the frame, stringers, and buffer-string.

A represents the front end of a car, and B B are the longitudinal beams or stringers of the same. C is a longitudinal frame fitted between the stringers, consisting of side-pieces D D, connected by cross-pieces E E, and F F, and provided at its lower edges with flanges G G, extending under the stringer, and secured thereto by means of vertical bolts H H.

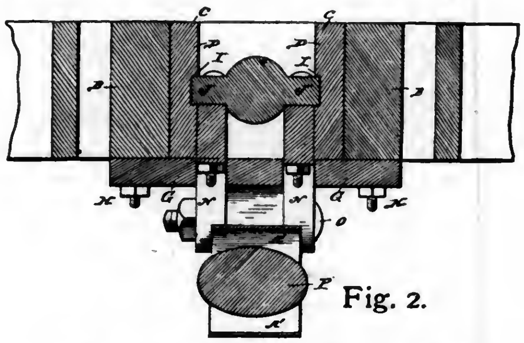

Fig. 2.

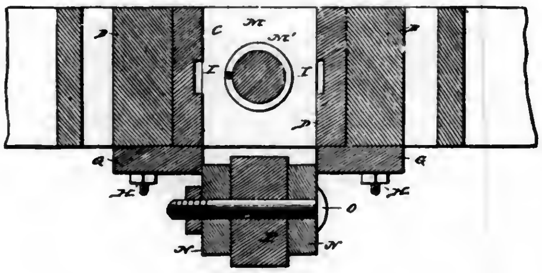

Fig. 3.

ZIMMERMAN'S CAR-COUPLING.

The inner sides of the frame-pieces D D, are provided with grooves I I, to accommodate a pair of slides J J, connected by a rod K, for the accommodation of which, as well as of the slides, suitable openings are provided in the cross-pieces of the frame. The rod K, is provided with shoulders L L, against which are fitted plates or washers M M, bearing against the inner sides of the cross-pieces

E E, of the frame; and upon the rod K, between the plates or washers, is coiled a strong spring M′, which in practice serves as a buffer-spring.

N N are a pair of longitudinal parallel hangers or brackets secured to the under sides of and connecting the slides J J, and provided with a central transverse pin or bolt O, forming a bearing for the rear end of the shank P, of the draw-head Q. The latter is provided with the longitudinal recess R, in which is fitted a sliding block S, adapted to be forced in a forward direction by the action of a suitably-arranged spring T, and having at its upper

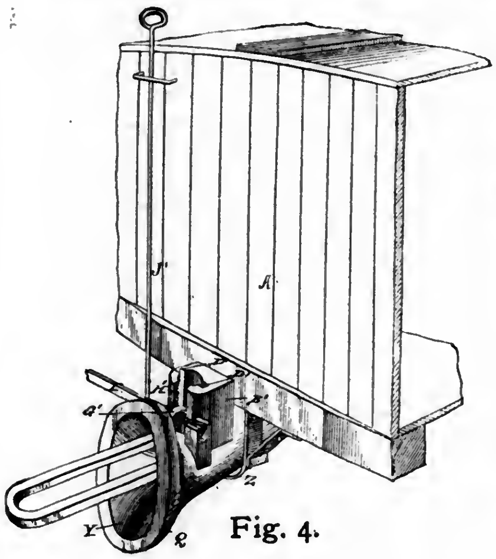

Fig. 4.

Fig. 5.

ZIMMERMAN'S CAR-COUPLING.

front edge a forwardly-extending plate U, adapted to extend under the upper vertical pin-hole V, and support the coupling-pin W, in position for coupling. A stop X, is arranged to prevent the sliding block from moving forward too far.

The mouth Y, of the draw-head is comparatively narrow, but of considerable height, and provided with beveled or slanting sides, top and bottom, for the purpose of enabling cars of unequal heights to be readily coupled without the use of crooked links. The shank P, of the draw-head is

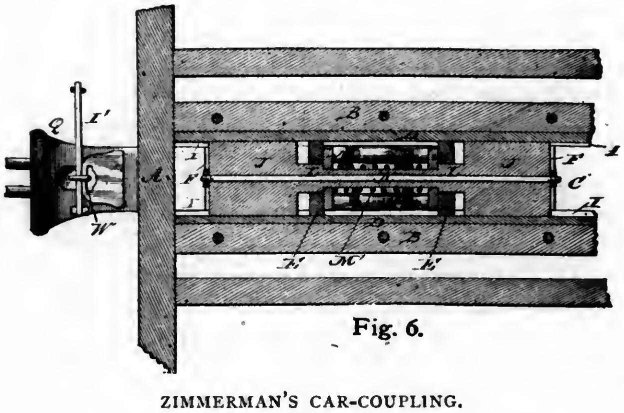

Fig. 6.

ZIMMERMAN'S CAR-COUPLING.

curved upward and hinged between the hangers N N, as already described, thus enabling the draw-heads of two cars of unequal height to swing, respectively, upward and downward when the cars come togethe , and thus adapt themselves to each other. In order to sustain the draw-head normally in a horizontal position, a pair of flat springs are bolted to the upper and under side of the draw-head, near the rear end of the latter, and, extending forward, bear, respectively, against the under side of the car and against a bail or bracket Z, bolted to the under side of the car and encircling the draw-head. These springs which are designated by letters A′ A′, also serve to impart the proper elasticity of motion.

The draw-head is provided with an upward-extending lug B′, provided with a pin-hole C′, registering with the pin-holes of the draw-head, and provided at the sides with vertical grooves D′, serving as guides for the flanges E′, extending laterally from the head of the pin F′. The latter is provided with a forwardly-extending hook G′, for the accommodation of which a slot H′, is provided in the front wall of the lug B′.

I′ is a lever pivoted to the draw-head at one side of the latter, and extending under the hook G′, so that it may be used to raise or lift the coupling-pin for the purpose of uncoupling the cars. Attached to the end or handle of this lever, is a rod J′, extending through suitable guides to the top of the car, so that the uncoupling may be performed by a brakeman stationed on the roof of the car.

The coupling devices are simple, certain in action, and easily manipulated, and the attachment of the draw-head to the car gives it a free and elastic vertically-swinging and longitudinally-sliding motion, which is useful and effective for the purpose described.

Pullman's Electric Bell-Cord for Railway-Trains.

SMITH C. PULLMAN, of Catskill, N. Y., is the inventor of a new electric bell-cord for use on railway-trains, that is herewith illustrated and described. The bell-cord couplings only will be shown in the cuts, as the application of the device is readily understood.

Fig. 1.

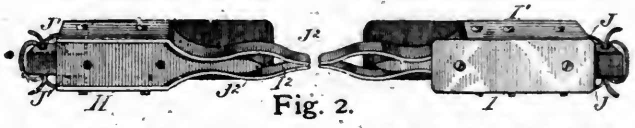

Fig. 2.

PULLMAN'S ELECTRIC BELL-CORD FOR RAILWAY-TRAINS.

In the accompanying cuts, Fig. 1 shows the couplings of the bell-cord when connected, and Fig. 2 the same couplings when disconnected.

On the cab of the locomotive is a switch by which the circuit may be opened when the engineer does not desire to hear the bell ring. The line-wires are insulated and are run in the bead of the moulding along the side of the car near the top, where they are out of the way and out of sight. At each end of each car are provided binding-posts which connect the line-wires and the push-buttons. From the binding-posts the line-wires extend through openings in the ends of the car over the door far enough to permit them to be coupled with the wires of the next cars. The projecting ends of the line-wires are connected to the improved coupling to form the circuit,

and the couplings are thus constructed: The body portions H, and two sides I I′, of the couplings are of hard rubber. The seats J for the binding-posts J′, are of brass, separated by the hard rubber. The body portion H, of the coupling is concave on each side near its forward end, and is then convexed until it forms the point P. To each side of the body portion H, is secured a German-silver spring J^2, which is bent to conform to the outline of the forward portion of the body H. The springs J, and the sides I I′, are secured in place by screws. The couplings are all alike in construction, so that the coupling can be effected at either end of the car. The cable consists of two wires, specially insulated, and run from the engine under the tank to its rear end. On the coaches the wires are covered with gutta-percha. When two couplings are shoved together, the hard rubber separates the springs, making two separate conductors. When the train breaks apart, the couplings pull apart, and the springs come together and close the circuit, which causes the vibrating bell on the engine to ring, and notifies the engineer that his train has parted. If the engineer does not want to hear the bell ringing until he has coupled up again, he can turn the crank of the two-point switch on the dead-pin, which opens the circuit, thus stopping the bell. The coupling on the rear end of the rear car can be shoved astride the cord to keep it open.

This system can be applied to all railway-cars without damaging the latter other than by boring eight small screw holes. It is inexpensive, reliable, and not subject to derangement. It is at present in experimental use on the Ulster and Delaware Railway, the New York, Susquehanna and Western and on the West Shore road, where it is giving satisfation. The inventor claims that the total expense of maintaining his system in use on a train of six cars, will not exceed fifty cents per year.

The device is now controlled by S. C. Pullman & Co., of Catskill, N. Y.

Stripe's Indicator-Lock.

Horace G. Stripe, of Omaha, Nebraska, is the inventor of a new and improved indicator-lock which is herewith illustrated and described. As here shown, the registering or indicating device is applied to a railway car-door lock, but it is similarly applicable to any form of lock.

In the accompanying cuts, Fig. 1 is a side view of the improved lock, the front plate being removed; Fig. 2 a longitudinal sectional elevation of the same on the line $x\ x\ x$ in Fig. 1; Figs. 3 and 4 show keys for the improved lock, and Fig. 5 is an end view of one of the keys.

The bolt A, is provided at its inner end with a notch A′, adapted to receive the sliding latch-bolt B, which moves transversely to the bolt A. The end of the latch-bolt B, fits into the notch A′, in the bolt A, and the latch-bolt B, rests upon a tumbler C, pivoted in the casing and adapted to swing toward and from that end through which the bolt A, passes, which tumbler is acted upon by a spring D, which presses it in the direction from the same end of the casing. The latch-bolt B, is provided in its under side with a downwardly-projecting stem E, which passes into a slot F, parallel with the axis of the tumbler, and provided with a transverse slot at each end. The latch-bolt B, is provided with a notch G, for receiving the bits of the key. In place of the above-described tumblers, any other tumblers of suitable construction can be used.

On the inner surface of the back of the casing an elbow-lever H, is pivoted by a pin H′, at its angle, which lever is provided at the end of its short arm with an upwardly-projecting tooth J, having a beveled edge. On the end of the other arm of the lever H, a tooth is formed, which is adapted to rest against a shoulder *a*, formed on the free end of the tumbler C. On a pivot K, a series of frames L, are pivoted, which have curved edges, and parts of the curved edges are provided with teeth, forming racks M, and on the upper surfaces of the other parts the numerals from 0 to 9, inclusive, or other characters are arranged,

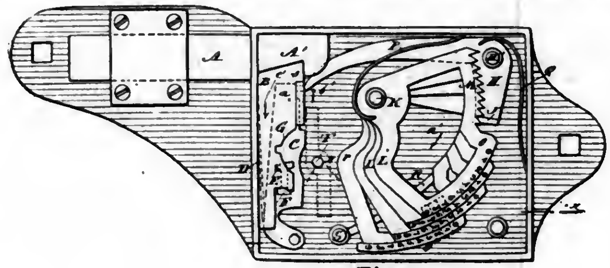

Fig. 1.

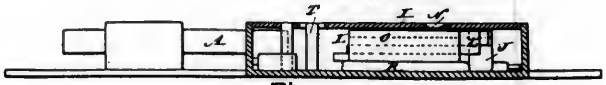

Fig. 2.

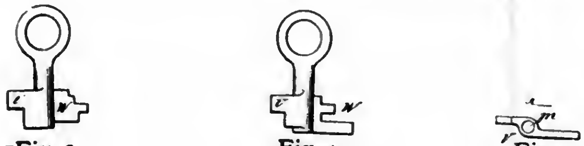

Fig. 3. Fig. 4. Fig. 5.

STRIPE'S INDICATOR-LOCK.

these numerals or other characters being arranged in segmental lines. The racks M, of the frame L, are arranged above each other, so that the ends of the teeth form vertical lines; but the parts O, carrying the numerals, are so arranged that their upper surfaces will be in the same plane, and the rows of numerals or other characters will be adjoining each other on parallel segmental lines. Each frame L, is provided with a spring P, which throws the frame in the direction of the arrow *a′*.

The elbow-lever H, is provided with a spring Q, which throws the end of its long arm in the direction of the arrow *b*. The bottom frame L, rests on a curved track R, and a check-pin S, is provided to limit the movements of the frames L, in the direction of the arrow *a′*. A pintle T, projects upward from the bottom or back of the casing and passes into the opening *m*, of the barrel of the key V.

All the keys used have two bits, U and W. The bits U, of the keys are shaped alike, and must be provided with more or less shoulders or offsets, according to the number of tumblers used with the latch-bolt B, and according to the configuration and shape of these tumblers and the arrangement of the same. The bits W, of the several keys are all different, for a purpose that will be shown.

The top plate I, of the lock-casing is provided with a slot N, the length of which is equal to the width of four (more or less) rows of numerals or characters on the parts O, this slot being so arranged that when the frames L, all rest against the stud or pin S, the numeral 0 of each row of numerals on the parts O, will appear in the

slot. Means are also provided for covering the slot N, with glass or any other transparent substance, which can be taken out or replaced when broken or destroyed without removing the lock.

The operation is as follows: If the key is inserted to draw the latch-bolt B, to permit moving the locking-bolt A, back or in the casing, the key is inserted, with the bit U, on top, and is then turned to the left. The bit then pushes back the tumbler C, so that the projection E, on the bottom of the latch-bolt B, will be at the bottom of the longitudinal slot F, and, then by further turning, the bit moves the bolt B, in the direction of the arrow *c'*, and when the pin or projection E, on the bottom of the latch-bolt B, arrives at the lower end of the longitudinal slot F, the spring D, forces the tumblers outward, and the pin E, passes into the bottom transverse slot of the longitudinal slot F, thus locking the bolt and tumblers in place. If the bolt is to be locked after having been pushed into the casing, the latch-bolt B, must be moved upward. To do this the key is inserted in such a manner that the bit U, projects downward. When the key is turned, the bit U, first pushes back the tumbler, thereby disengaging the bolt, and then throws the bolt B, upward in the inverse direction of the arrow *c'*, and causes its end to pass into the notch A', in the bolt A. By turning the key in such a manner that the bit U, can act on the tumbler C, and the bolt B, the bit W, is turned in such a manner as to act on the curved shoulders *r*, of one or more frames L, thereby swinging the frames L, in the inverse direction of the arrow *a'*, a greater or less distance, according to the length of that part of the bit acting on each separate frame L. As the frames L, are moved in the inverse direction of the arrow *a'*, at the same time that the bolt is thrown, the spring Q, of the lever H, moves the long arm of the angle-lever H, upward, thereby causing the tooth J, at the opposite end to move in the direction toward the racks M, and engage with the teeth of the same. After the bolt B, has been thrown, the frames L, are held in the different positions by the tooth J, the positions varying according to the length of the parts of the bit W, acting on the several frames. Different numbers or characters on each curved part O, of each frame L, will appear through the slot N, thus showing what key has been used to throw the bolt B, and thus lock the bolt A, in place. If any key is used to throw the bolt B, the key is inserted with the bit U, upward, as stated before, and turned to move the bolt B, downward. At the same time the bit W, of the key presses the frames L, slightly in the inverse direction of the arrow *a'*, thereby causing the beveled teeth of the rack to force the tooth J, outward from the racks. By the time the tooth J, has been disengaged from the teeth of the racks M, the shoulder *s*, on the latch-bolt B, begins to act on the large arm of the angle-lever H, and moves it in the inverse direction of the arrow *b'*, thereby disengaging the teeth of the racks entirely from the tooth J, and permitting the springs P, of the several frames L, to throw the frames in the direction of the arrow *a'*, until all the frames rest against the stop-pin S.

For a switch-lock, the inventor claims the above-described device especially suitable, as it would thus show, in case of accident, who last locked the switch and, by a secondary device, it may also be shown what particular key was used to lock it.

Scott's Car-Axle Box.

James O. Scott, of Tyler, Texas, has recently invented an improved axle-box for car-axles, which is herewith illustrated and described. It is the object of the inventor to provide an axle or oil-box for car-axles, so arranged and constructed that the lid or cap thereof will be automatically and securely held in position when closed, and also to provide an axle-box having a detachable cap, provided with inwardly projecting pins or trunnions upon its flanged ends, which run in grooves in the opposite walls of the box, in conjunction with inwardly-turned flanges upon the end flanges, whereby the cap is not only closely drawn against the open end of the box, but may also be raised and thrown over upon the top of the latter and retained in that position by its own gravity.

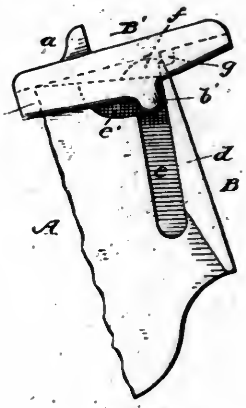

Fig. 1.

SCOTT'S CAR-AXLE BOX.

In the accompanying cuts, Fig. 1 is a side elevation of so much of a car-axle box as is necessary to illustrate the invention, the cap being elevated; Fig. 2 a detail view of the cap detached, and Fig. 3 a side view, partly in section, showing the lid down.

A represents the axle or oil-box of the ordinary construction, provided with vertical sides or ends. B is the usual opening in the front of the box for the insertion of

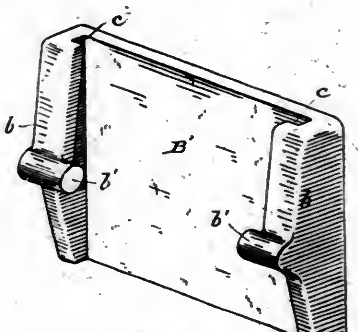

Fig. 2.

Fig. 3.

SCOTT'S CAR-AXLE BOX.

the oil and packing. B' is the cap or lid for covering the opening B. It is of any suitable material, and preferably a rectangular plate, having in the center thereof a lug or protection *a*, which serves as a handle to raise the cap when it is desired to uncover the opening B. At each end or side of the cap B', is an extension *b*, provided with a pin *b'*, at right angles thereto. Extensions *b*, are also provided on their inner sides with wedge-shaped grooves

c, as shown. These grooves *c*. are about one-half the width of the cap B′, terminating at the pin *b*′. It has been found expeditious and productive of excellent results thus to arrange these grooves. On the sides or ends of the box are formed wedge-shaped flanges *d*, which slide in the correspondingly-shaped grooves *c*, in the cap or lid of the box, thus locking the cover firmly to the box before the pivots *b*′, reach the bottom of the grooves *e*. The pins *b*′, slide in inclined grooves *e*, on each side of the box A, near its front end. Across the front end of the box at its top, is a ridge *f*, against which the knob or rivet *g*, in the cap B′, strikes and prevents the cap from being drawn further back and out of the grooves *e*. A lip or extension *e*′, of the grooves *e*, at the top of the box clearing the ridge *f*, permits the withdrawal of the pins and removal of the cap B′, from the box when the knob or rivet *g*, is removed from the cap. It will thus be understood that in order to fasten the cap upon the box securely and tightly, it will only be necessary to drop the cap and allow it to slide into position upon the box, and insert the rivet *g*, as seen in Fig. 3. When it is desired to open the box it is only necessary to push upward on the handle *a*, and the grooves and flanges will readily become unlocked, thereby allowing of the elevation of the cap B′ to the position seen in Fig. 1.

Importance is attached to the grooves *c*, arranged in the upper half of the cover, in their adaptability to serve with the flanges *d*, of the box, to wedge the lid firmly in place before the pins *b*′, reach the bottom of the slots *e*.

The inventor has assigned one-half the patent-rights to Fred L. Dilley, of the same place, to whom all communications should be addressed.

Bailey and Alexander's Automatic Water-Gage.

Lewis C. Bailey and W. Scott Alexander, of McConnellsburg, Pa., are the inventors of an improvement in automatic water-gages, which is herewith illustrated and described. It is the object of the inventors to provide a water-gage which will act automatically to close both the water and steam-tubes of the gage should the glass indicating-tube be accidentally broken while the boiler is in operation. In the old form of water-gage if the glass tube be accidentally broken from any cause whatever, the steam and water will be forced out, so as to scald the engineer or other attendants before they can reach the cocks or valves to close or cut off the connection.

In the accompanying cuts, Fig. 1 is a longitudinal section of the water-gage and a portion of the boiler, illustrating the attachment, and Fig. 2 a detail view of the strainer.

A and B are two gage-cocks having their inner ends exteriorly threaded to screw into suitable openings at the upper and lower portions of the boiler G, so that the cocks will communicate, respectively, with the steam and water spaces of the same. The cocks A B, have hexagonal projections *a b*, on their inner ends forward of the exterior threads to receive a wrench or other instrument in attaching them to the boiler, and are interiorly threaded at E E, to receive the threaded ends of thimbles F F′, the latter, F′, having a cylindrical-shaped strainer C, formed therewith and projecting through the water of the boiler, so as to exclude dirt and other matter from passing into the cock, and yet permit the free circulation of water into the cock B.

The cocks A B, are each provided with a longitudinal passage D, extending through the same from the inner to the outer end, and a transverse passage I, extending through extensions H H′, projecting, respectively, downward and upward from the cocks A B. The glass tube J, is attached to the extensions H H′, which are threaded to receive stuffing-boxes K K, forming a water and air-

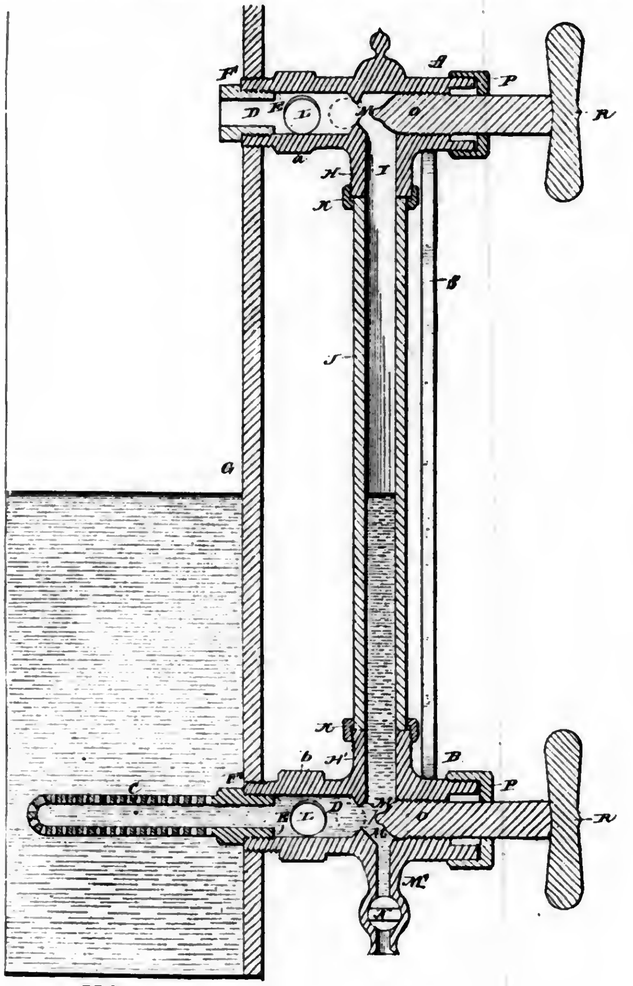

Fig. 1.

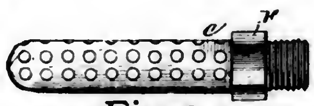

Fig. 2.

BAILEY & ALEXANDER'S AUTOMATIC WATER-GAGE.

tight connection therein. It will be seen that the longitudinal passages D, and transverse passages I, form a means of communication with the glass indicating-tube, so that the water from the boiler will enter the passage D, of the cock B, pass through the transverse passage I, and enter the glass tube to show the true depth of water in the boiler.

Arranged within the passages D, of the cocks A B, at their inner ends are balls L L, adapted to work in the passage, the thimbles F F′, preventing the balls from passing out into the boiler, pointed lugs M M, extending inwardly into the passage D, from the sides and at the forward ends thereof, and serving to limit the forward movement of the balls. A branch pipe M, extends downward from the cock B, and is provided with a valve or

cock N, through which to draw off the water from the glass tube to prevent freezing when not in use.

O is a stem or spindle threaded at one end to screw through the outer ends of the cocks A B, a stuffing-box P, being fitted over the ends around the stem to preserve a water-tight connection. The inner ends of the stem O, are rounded and project forward sufficiently, so that when screwed inward they will force the balls L L, backward or inward through the passage D, for the purpose hereafter explained. The outer ends of the stems O, are provided with hand-wheels R, for convenience in operation. Guard-rods S S, two in number, one of which is not shown in the cuts, are attached to the outer ends of the cocks A B, and serve to guard the glass tube from breakage.

The operation of the device will be readily understood from the foregoing description taken in connection with the accompanying cuts. The cock A, is attached to the upper portion of the boiler, and allows the passage of steam, and the cock B, is attached to the lower portion thereof, and permits the free circulation of water, the glass tube connecting the two cocks in the manner well known. As will be seen, the water from the boiler passes through the cock B, into the glass tube, so as to show the true depth of water therein, since the balls L L, do not interfere with the free passage of water and steam while the boiler is in operation. Should the glass tube be accidentally broken, the force of the steam and water will force it into the position shown in dotted lines in Fig. 1, the balls closing the outlet of the passage D, and thus preventing the escape of hot water and steam. In this manner a safety-gage will be provided which will be automatic in its action to prevent the scalding of the engineer should the glass tube be accidentally broken while the boiler is in operation. After a new glass tube has been replaced, the wheel R, is turned to cause the inner end of the stem O, to come in contact with the ball L, in the cock B, to force it back a slight distance until the water fills the glass tube, the same operation being repeated with the upper cock A, to admit steam, when both balls L L, will assume their natural positions, as seen in full lines in Fig. 1.

If, at any time, the boiler is empty and the glass tube is broken, and yet it is desired to fill the boiler to obtain a sufficient amount of steam, it is only necessary to screw the stem O, inward and against the lugs M M, to close the passage D, and there let it remain, since both balls will occupy the position shown in full lines when there is no water in the boiler. When the boiler is filled and in operation, there will be no force on the balls unless the glass tube should be broken. It will be seen that the balls will be allowed to move freely in the passages D, the thimbles F F′, limiting their movement inward, while the pointed lugs M M, provide a seat and hold them from forward movement. The strainer will exclude the passage of dirt into the cock B, and yet allow the free circulation of water to the glass tube. The balls act automatically to prevent, upon the breakage of the glass tube, the passage of water or steam outward to do injury to the attendants, and when the glass tube has been replaced by a new one, the stems O, are operated to restore the parts to their original positions.

The device is simple in construction, automatic in action, inexpensive to manufacture, and claimed to be of great utility for the purposes intended.

Wine's Car-Coupling.

Henry Wine, of Marion, Ind., has recently invented an improved car-coupling which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a perspective view showing the car-coupling attached to the end of a car in position for operation; Fig. 2 a longitudinal vertical sectional view of the same; Fig. 3 a vertical transverse sectional view taken on the line x x in Fig. 2, and Fig. 4 a detail view showing the several parts of the car-coupling separated or detached from each other.

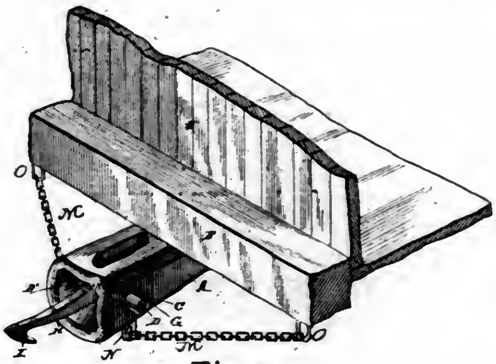

Fig. 1.

WINE'S CAR-COUPLING.

A is the draw-head of the car-coupling, which is suitably attached to or connected with the end of the car B. The draw-head A, is provided with the usual mouth or opening B′, and its sides are provided with openings C, forming bearings for a transverse shaft D. The latter is provided at one end with a head or handle E, and at its other end with a flange or feather F, for the passage of which the openings C C, are provided with rearwardly-extending slots G. Mounted upon the shaft D, is a

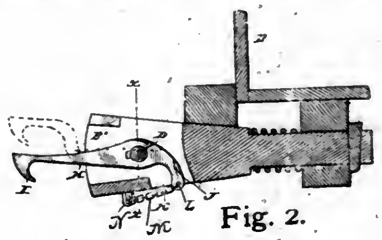

Fig. 2.

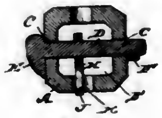

Fig. 3.

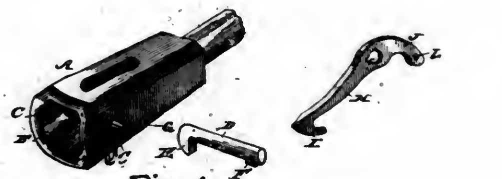

Fig. 4.

WINE'S CAR-COUPLING.

coupling hook H, the front end of which is formed with the hook I, adapted to engage the shaft D, of the draw-head of the opposite car, while its rear end is provided with an arm J, extending downward, as shown, through an opening K, in the bottom of the draw-head, and having a perforation L, with which is connected a chain M, which is secured in the eye at its middle, passes through eyes or staples N, at both sides of the under side of the draw-head, forward of the eye in the hook, and from these eyes to staples O O, at the sides of the platform of the car, so that the hook may be tilted upward by pulling either of the ends of the chain.

When desired, for the purpose of coupling with cars of unequal height, the coupling hook may be bent or twisted, as shown in dotted lines in Fig. 2 of the drawings.

The construction of this device is simple and inexpensive, and it is easily manipulated and certain in its action, while it be may be used in connection with the link-and-pin coupling.

Willson's Door for Grain-Cars.

CHARLES P. WILLSON, of Summit Point, W. Va., is the inventor of an improved door for grain-cars which is herewith illustrated and described. The object of the invention is to provide the separate board sections which compose the door with metal eyes which are open on one side, whereby they may slide on the vertical rods and be detached therefrom, and also to provide vertical guides adjacent to the vertical rods, whereby the board sections are prevented from detachment while in the doorway.

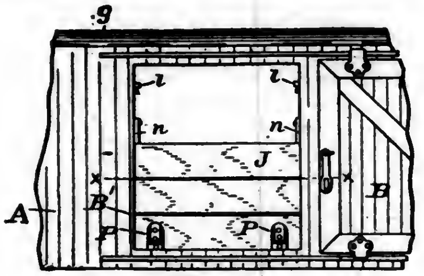

Fig. 1.

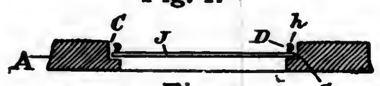

Fig. 2.

WILLSON'S DOOR FOR GRAIN-CARS.

In the accompanying cuts, Fig. 1 is an outside view of the car-door; Fig. 2 a horizontal section on the line x x; Fig. 3 a vertical section of one-half of one side of a car, showing the door; Fig. 4 an inside view showing the position of the door-sections when they close the doorway; Fig. 5 a view of an end of a section separately show-

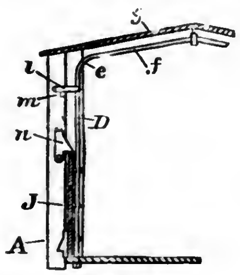

Fig. 3.

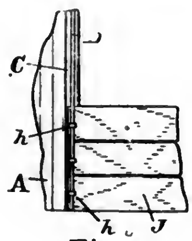

Fig. 4.

WILLSON'S DOOR FOR GRAIN-CARS.

ing the sheet-metal tip thereon to protect it; Fig. 6 a view of the eye attached to each section, and which slides on the rod, while Fig. 7 shows the lifting-lug on the lower section.

An ordinary box freight-car A, has a sliding door B. To adapt such cars for carrying grain in bulk, provision must be made for closing the lower part of the doorway B′, so as to make it tight enough to prevent the loss of grain. Heretofore this has been done by placing boards across the doorway on the inner side and nailing them to the door-frame. This, however, has been a resort of such a temporary nature as to prove both troublesome and expensive. The door to which this improvement relates consists of separate board sections, each provided with metal eyes and two vertical rods, one each side of the doorway, whereon the eyes slide, whereby the board sections may be raised and lowered to open or close the lower part of the doorway.

At each side of the doorway is a vertical rabbet-shaped guide C, which assists to keep the board sections in position as they move up or down.

Fig. 5.

Fig. 6.

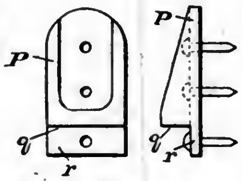

Fig. 7.

WILLSON'S DOOR FOR GRAIN-CARS.

Adjacent to each guide and partly occupying it is a rod D, the lower end of which is made fast to the bottom part of the car-frame. The upper part of this rod has a curve *e*, which gives it a nearly horizontal direction from the doorway toward the middle of the car, as seen in Fig. 3, where it is made fast. This nearly horizontal part *f*, of the rod is just below the car-roof *g*.

The board sections J, have near each end an eye *h*. Each eye takes loosely about one of the rods D, and is adapted to slide thereon. The end of each board section, is, preferably, protected by a sheet-metal tip *k*. (See Fig. 5.) The eyes *h*, as plainly shown in Figs. 2 and 6, are open at one side, in order to permit their detachment from the rods D. It will be seen by reference to Fig. 2 that both of the eyes on each board section have their open side in the same direction, from which it results that when the board section is moved endwise the open side of the eyes will allow them to disconnect from the rods. As long, however, as the board sections are in the doorway, or the ends of the board sections are confined by the guides C, this "endwise movement" cannot take place; but when the board sections are raised above the guides and passed over the curves *e*, on the nearly horizontal part *f*, then the endwise movement may be made.

When it is not desired to have the doorway closed by the board sections, they may be kept stowed out of the way just below the car-roof on the nearly horizontal part *f*, of the rods. To retain them from slipping down in front of the doorway, each side of the doorway-frame is provided with a pivoted hold-up or button *l*, whose free end, when in a horizontal position, projects across the path of the board sections. A stop *m*, below the pivoted button, prevents its turning down, but it is free to be lifted by a person's finger. It will be seen that in raising the board sections they will pass the hold-up button; but the latter device will prevent them from slipping down.

To hold the board sections down firmly to the floor, another button *n*, is pivoted to the side of the doorway-frame. This button must be adapted to allow the board sections to come down, but when all are down, prevent them from rising.

The lowermost board section is provided on the outer side with lifting-lugs P. This is a cast-metal plate to rest

against the section, and is attached by bolts. An under shoulder q, is to receive the end of a lever, such as a crow-bar, and the plate r, below the shoulder, is to protect the wood of the section from the end of the crow-bar. By this means all the board sections, which are held tightly by the lateral pressure of the grain, may be raised from the bottom of the car to allow the grain to flow out under the sections.

The expense incurred in using this improved device is slight, the additional cost being only that of the iron rods, eyes and catches, which are permament. The device is simple and not liable to derangement.

Varian's Adjustable Coal-Screens.

SAMUEL T. VARIAN, of East Orange, N. J., is the inventor of two improved screens for sifting coal and other material, both of which are herewith illustrated and described. Though similar in principle, they differ in construction and operation, and will be described separately. The first device consists of a screen composed of elliptical bars that are capable of partial rotation upon end pivots, so as to open or close the spaces between the bars, and thereby adapt the screen to the removal of dust and small coal from various sizes of coal passing over such screen.

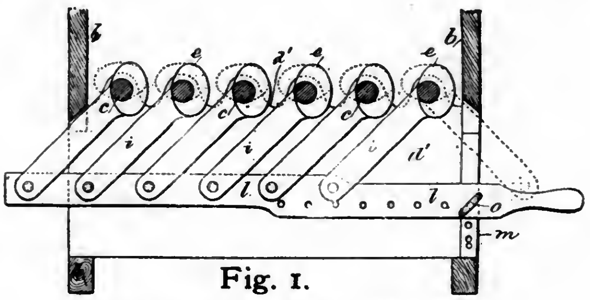

Fig. 1.

VARIAN'S ADJUSTABLE COAL-SCREENS.

In the accompanying cuts, Fig. 1 is a cross-section of the chute, showing the bars, their pivots in section, and the arms by which they are adjusted; Fig. 2 a section longitudinally of the chute, and Fig. 3 a plan view, partially in section. Figs. 4 and 5 on the succeeding page refer to the second device, which will be described hereafter.

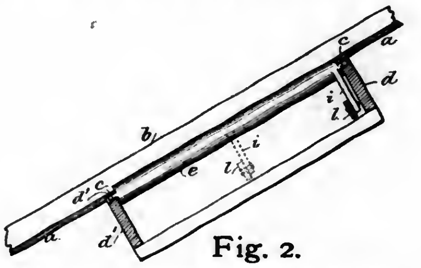

Fig. 2.

VARIAN'S ADJUSTABLE COAL-SCREENS.

The chute is composed of a bottom a, and sides b, and it is at an inclination, so that the coal or other material will run down the same, and it is to be of any desired size. The bars e, of the screen are preferably in line with the chute, and each bar has two pivots c, one at each end, and these pivots are received into holes or sockets in the end-bars or frames d d'. Each bar e, is elliptical or eccentric to its pivots, so that one edge of the bar is at a greater distance from the axis than the other edge. The sectional shape of each bar may be that of a flattened cylinder, or elliptical or polygonal; but preferably elliptical.

When the bars are swung so that their conjugate diameters are horizontal or in line with each other, as seen by dotted lines in Fig. 1, the spaces between the bars will be the narrowest, and when the bars are turned so that their primitive diameters are in line with each other, as shown by the full lines in Fig. 1, the spaces between the bars are the widest. The bars are therefore to be shaped and proportioned so that the openings will be within the required ranges of width for the various sizes of materials to be screened or separated from the materials passing over the bars. Each bar is provided with an arm i, at an angle of forty-five degrees to the conjugate diam-

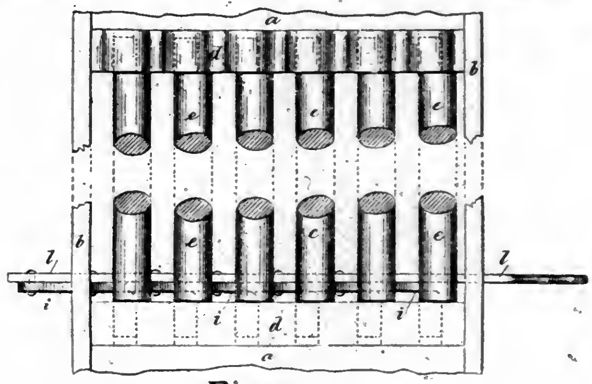

Fig. 3.

VARIAN'S ADJUSTABLE COAL-SCREENS.

eter, or nearly so, and the arms i, are connected by pivot-pins or screws, to the bar l, and this bar can be moved endwise and held in any desired manner—such, for instance, as by the pin o, inserted through a hole in the bar into one of the holes upon a cross-piece or segment m. These arms may be near the upper ends of the bars, as shown by full lines, or else near the middle, as shown by dotted lines in Fig. 2. By this construction the width of the openings between the bars may be varied, thereby allowing dust, or small coal or other material, to pass through and separate from the larger materials that slide down the chute and over the bars of the screen. The lower cross-bar or frame d', is made with a corrugated or undulating upper surface, corresponding, or nearly so, to the bars e, near their lower ends, so that there are not any portions that project above the upper surfaces of the bars to interfere with the coal as it slides down the screen.

Figs. 4 and 5 refer to the second device, which is similar in principle and designed to effect the same purpose as the screen above described. This device provides for the combination, with a set of stationary bars, of a set of bars movable transversely beneath the stationary bars, so as to close partially the opening between such bars, and thereby adapt the screen to different sizes of coal or other material. The stationary bars have openings between them adapted to the screening of the largest sizes that are to be separated, and when the movable bars are slid laterally from beneath the stationary bars, the openings are reduced in size, and the screen is adapted to the screening of smaller sizes of coal.

In the accompanying cuts, Fig. 4 is a longitudinal section of the screen complete, and Fig. 5 a transverse section of the same. A A are the side pieces and B and C

the bottom portions of a chute that is placed at an inclination, and down which the coal or other material to be screened is caused to run. The bars E, are stationary and attached at their upper and lower ends to cross-bearers F G. placed across the chute, and the portion B, of the chute is usually made of sheet-iron above the upper ends of the bars E, while the portion C, of the chute is below the bars E, and even with the top of the cross-bearer G. There is also a cross-bearer H, beneath the bars E, and fastened to their under surfaces, so as to stiffen the bars and prevent lateral deflection. Beneath the bars E, there is a frame composed of the end-pieces I J, and connecting-bars L. The end pieces I J, are supported upon the cross-bearers F G, preferably by ribs O, so that the frame I J, and bars L, can be moved laterally

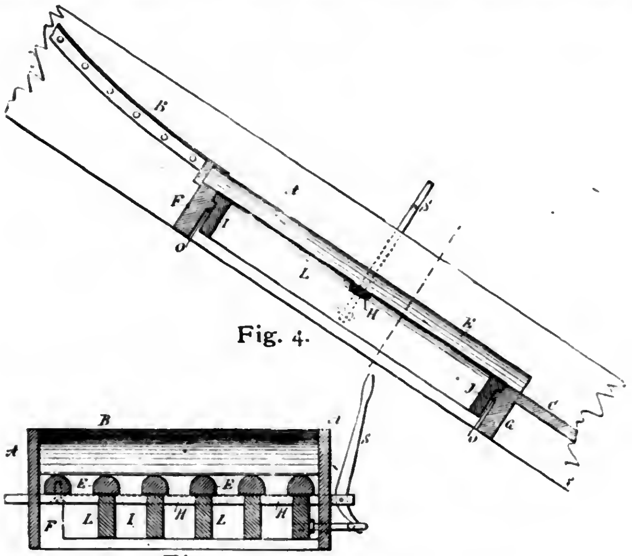

Fig. 4.

Fig. 5.

VARIAN'S ADJUSTABLE COAL-SCREENS.

across beneath the bars E. The bars I, are notched in their upper edges, where the stationary bar H, connects the bars E, so that the upper surfaces of the bars L, are close to the under surfaces of the bars E. By means of a lever S, or other suitable means—such as a screw—the frame I J L, is adjusted laterally and held in any desired position. When the bars L, are entirely beneath the bars E, the screen is adapted to the largest sizes of material, because whatever material is smalller than the distance between the bars E, will fall through, and the larger material will slide on the bars E, and run down the chute. If, now, the screen is to be adapted to smaller sizes, the frame I J L, is moved laterally, so that the bars L, partially close the spaces between the bars E, thereby adapting the screen to the separation, from the coal sliding down the chute, of all material that is sufficiently small to pass through between the lower edges of the bars E, and the upper edges of the bars L.

A New Wood Preservative.

An antiseptic wood preservative which lately has made its appearance in the market and is recommended by exceedingly good testimonials is the "Carbolineum Avenarius." It acts in a mechanical and chemical manner. A liquid substance of very great specific gravity (about 1.14), it penetrates easily into the wood and forces out all water contained in the capillary cells and channels, while its fatty constituents do not allow any to reënter, and protect the timber against it, and against atmospheric influences. It contains about 20 per cent. of antiseptic bodies which have the effect of destroying all germs and preventing rotting, and decay and fungus, and kill the vermin and woodworm which may be in the timbers and prevent their generating in it.

The Carbolineum Avenarius is applied like paint with a brush. On exposure to the air it oxydizes and gives the wood a handsome nut-brown stain. Wherever possible it should be applied hot, since it will, in a thinner state, easier penetrate into the timber. No pressure or suction of any kind is necessary in its application, and steeping the timber in the substance is in many cases preferable to painting it. The substance is not at all inflammable, its boiling point being at about 295° Cent. or about 550° Fahr. and it may be kept in tightly closed vessels for any length of time without losing any of its useful qualities.

Its successful use upon railway-ties, bridges, telegraph-poles, sheds, flooring and shingles, has been demonstrated and asserted by many European government officials and railway managers, etc., and among others in this country, the Pennsylvania Railroad, the New York Central and Hudson River Railroad, the Union Ferry Company, etc., have given orders for its experimental use.

Captain Avenarius, of the German army, is the inventor of the Carbolineum Avenarius, which solves the problem of preserving timber to a considerable degree. Messrs. Schultze-Berge & Koechl, of 75 Pine Street, New York, are the sole agents in the United States.

A Scale of Hardness for Metals.

The following is a scale of hardness in use in the laboratory of the Technical High School at Prague, composed of eighteen metallic substances, arranged in ascending order from the softest to the hardest:

1. Pure soft lead.
2. Pure tin.
3. Pure hard lead.
4. Pure annealed copper.
5. Cast fine copper.
6. Soft bearing metal (copper, 85; tin, 10; zinc, 5).
7. Cast iron (annealed).
8. Fibrous wrought iron.
9. Fine-grained light-gray cast iron.
10. Strengthened cast iron (melted with 10 per cent. of wrought turnings).
11. Soft ingot iron with 0.15 per cent. carbon (will not harden).
12. Steel, with 0.45 per cent. carbon (not hardened).
13. Steel, with 0.96 per cent. carbon (not hardened).
14. Crucible cast steel, hardened and tempered, blue.
15. Crucible steel, hardened and tempered, violet to orange-yellow.
16. Crucible steel, hardened and tempered, straw-yellow.
17. Hard bearing metal (copper, 83; zinc, 17).
18. Crucible steel, glass hard.

The Housatonic Railroad announces two fast express-trains with drawing-room cars attached, leaving New York at 3:40 P. M. and Pittsfield at 4:15 P. M.

GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, *November 3d; 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer, or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, President.

American Railroad Journal.

WHOLE NO. 2,567.] NEW YORK, AUGUST, 1885. [VOLUME LIX.—No. 5.

FUEL ECONOMY.

BY FRANK C. SMITH.

[Written for the AMERICAN RAILROAD JOURNAL.]

ONE of the largest fields for the reduction of expenses on a road is in the coal consumed by the engines. This item alone is from 11 to 15 per cent. of the total expenses of a road dependent on the accessibility of coal mines, and the care and manner with which coal is used. It is the practice of too many roads to allow all record pertaining to the coal account to disappear after it is purchased and delivered to the locomotive department, where too often engineers take much or little, use it carefully or wastefully, as they see fit. It has been well said that a road might as well furnish each engineer with money to buy his coal with, and keep no individual account of the money but make one grand charge of it to "coal account," as to follow the practice so many of them do.

A great many roads store their coal on docks, fitted with cranes for lifting half-ton buckets for delivery to engines, the engineers giving a check for the amount of coal received, and so far as this is concerned no fault can be found. But the fault commences in keeping account of the coal, and in the abuses of the premium system. Where roads pay the engineer a premium—generally half the value of the coal he saves over a given limit per car mile—it is too frequently the case that engineers bribe the dockmen with a quarter of a dollar to put an extra ton on their tenders, which, as an investment, is profitable to the engineer, since if coal be worth, say, two dollars per ton, the engineer gets credit for saving a ton, which means one dollar, less what he gives as a bribe to the dockmen, and this is clear gain to the engineer. Such "rings" as this are much more common than is believed, inasmuch as the dockmen are the cheapest class of laborers whose only duty is to shovel coal and receive the checks for it, and a small bribe makes a very effective lever with them. As the coal account is never balanced, that is, the amount of coal left on the dock weighed at stated times and added to the amount charged out to the engines, to ascertain if it tallies with the amount dumped on the dock from the cars, no trace of the extra tons surreptitiously given out is to be found.

Injustice, unintentionally, is done the engineers, where their record for premiums or good standing is based on the number of cars hauled a given distance for a given amount of coal, from the fact that few roads have a correct rating for the real amount of coal consumed in hauling mixed trains of light and loaded cars. That is, one road may *guess* that two light cars are equal to one loaded car; another, that five light cars equal three loaded cars; another, that seven light cars equal three or four loaded cars. As this is all guess-work, the engineer who happens to haul trains in which the error, which ever way it may be, of this guess predominates, suffers. However, it is said, that this is as fair for one engineer as another, and possibly it is, but it is evident that the injustice still remains.

In this connection may be mentioned the fact that few or no roads separate the coal consumed into engine and car miles. That is, the engine itself requires a certain amount of coal to propel it, and unless this amount is known and separated from the car miles, it all goes in to swell the amount consumed per car mile. Now it is clear that as this amount remains constant, the amount per car will be greater as the number of cars are less, and less as the number of cars are increased, so that when business is good on the road the engineer apparently is burning less coal per car mile, and when business is light the showing is against him.

To get at anything like a fair and equitable arrangement as well as a profitable one for the road, the coal business should commence from the bottom. A road in buying coal should test it practically by taking a train with engine, loading the tender with a known amount of a certain kind of coal, running the train under conditions of speed, stops, etc., which are recorded, and ascertain how far or how much coal is consumed per car mile; then with the same train and engine under the same conditions test another kind of coal, and in this way ascertain which is the cheapest coal to use.

The coal business down to the time it is delivered to the engines, might well be placed in the hands of a coal agent, who is independent of the locomotive department, in order that the results may be disinterested, as many master mechanics have a prejudice for or against engines of their own or other builds, and such prejudices are apt to shade the results of their performance. By this means the relative value of different types of engines may be determined, and the bad record of a "pet" engine or class of engines brought to the surface.

Some system which keeps a constant pressure on each engineer to do better should be adopted. The premium system acts upon an engineer's avarice and appears to give the best results; another system—that of "blacklisting" or posting up in the roundhouse the names of engineers who burn over a given limit of coal—is supposed to act on the engineer's pride, while the system of suspending an engineer who exceeds the limit for two or more consecutive months, acts on his fear and indirectly his avarice, as it stops his pay for the time being.

In order to get a proper rating, the fuel consumed to run the engine *alone* should be ascertained, and then the amount to haul a loaded and a light car. This can be easily ascertained, and by so doing the exact amount per car, whether loaded or light, and independent of the amount to propel the engine can be charged against the

engine. This should be ascertained for Winter and Summer, as it is plain that the amount will increase in Winter, when the losses from radiation of heat, slipping of engine, and greater friction of car-journals from stiffened oil will require more power and consequently more fuel.

It will be charged by practical men that such a system would involve a great deal of clerical labor, which is not true, as the practical man for want of experience in the keeping of accounts is afraid of them and exaggerates the matter. Any road with officials at the head of its locomotive department who understand the importance of the saving which can be effected by a proper course in the matter, can, by changing their present plan to one based on this system, effect the result with no increase of clerical work, for the plan is not more complicated than many unsatisfactory ones in use, and it does not involve complication or increase of labor, but simply a correct systemization of accounts, and it would therefore in many cases decrease the clerical labor and in no case augment it. The saving which may be expected to result will vary from 10 to 15 per cent. As an example of this, the wriier may cite a case in his personal knowledge in which seven passenger engines of the same build, size, and condition are pulling indiscriminately—that is, "first in first out"—the through passenger-trains of a certain road. Two of these engines average five tons of coal for a round trip while the other five use from that amount up to nine tons. The difference is not in the engines but in the men, for either of the two men using five tons have done the same with each of the other five engines, and the two engineers using but five tons admit they could save from one-half to three-quarters of a ton if they tried hard to do so. This road has no system at all for reducing the coal consumption, and the want of it is seen from this statement. As the road refered to is a large road of several divisions these results may be taken as a sample of what the rest of the engines are doing. The road has some three hundred engineers, and taking the performance of these seven engines as a standard, it will be seen that they average about three tons of coal each unnecessarily burned per day, for a service of three hundred days per year. The result is astonishing, since the coal is worth $2.00 per ton on the tender and the product of the whole gives $540,000 as the value of the coal *unnecessarily burned.* But even if this estimate be five times too large, the waste still amounts to over $100,000 per year; a sum any road might well save. It is, perhaps, unnecessary to add that the road refered to is in the hands of a receiver.

FREE-TRADE IN RAILWAY TICKETS.

BY S. S. HERRICK.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE writer is neither a railway official nor a ticket-broker, and therefore not a partisan in the bitter strife now and sometime waging between these parties. His position is that of an interested spectator, desirous of seeing fair play, without damage to the real interest of either the public or the railway companies. Though this controversy notably affects the convenience and the pocket of the traveling public, they have made no public demonstration of concern. It is obvious that the scalper has the approval, if not the sympathy, of the great majority, from the liberal patronage which is accorded him; and equally so that, though numerically the weaker party, he is almost uniformly the successful one. Such is likely to be the result to the end of the chapter, and so it might be superficially supposed it ought to be, on the ground that the just cause is sure to win; but it is better to examine below the surface of the subject.

The controversy has reference to coupon and round-trip-tickets. The reduced price is an inducement for increased travel and no doubt this more than compensates for diminution in rates; but it is required that no one but the original purchaser of the ticket shall have the privilege of using it. If it could be alleged that this condition is imposed in order to keep objectionable persons from the trains, the reason might be a good one; but no discrimination is made at the time and place of purchase, and no one pretends to account for the restriction in this way. The object is simply to prevent the traveler from obtaining passage from one point to another at less than the local rate, unless he alone is to complete the journey within a limited time. If anyone else can manage to travel on the ticket, both will be sure to avail themselves of a practicable chance to save money, and this saving the official regards as so mnch loss to his company. It is well to see whether this supposition be correct.

Every reduction in railway rates is made with the view of increasing patronage to a degree more than compensatory. Curtailment of the offer by conditions which throw difficulties and uncertainties in the way certainly detract from the inducement to travel, and so far counteract the advantages to the public and the company. As a mathematical certainty in the present case, the actual saving to the public in individual rates and the aggregate gains of the companies depend largely upon the notorious success of travelers and scalpers in circumventing railway officials. Suppose failure to be the rule, is it not clear that many would stay at home who now travel?

What then is the result of all this controversy? Simply annoyance to travelers, and cultivation of a spirit of resentment and determination to "beat" the railway at every opportunity. If the conflict were confined to the companies on the one side and the scalpers on the other the issue might be different; but the latter have the great public for allies and do a thriving business.

Suppose now, that one of a number of competing lines should be liberal enough to abolish all these silly restrictions and annoyances; could there be any doubt that it would speedily gain a largely increased patronage at the expense of its rivals? And when all had abandoned this narrow policy, the public would rejoice in the removal of detested obstacles, the companies would find their business increased and nobody would be the loser.

It is apparent that people will purchase and use articles quite in the same ratio with which they can transfer them to others. Why not put railway tickets on the same footing as bank-checks, notes and drafts? Let anybody use them, and they would be bought more freely, in full confidence that they can be enjoyed without risk or hindrance. The same reasoning might apply to a time-limit on tickets but this point is not now discussed.

There is besides an ethical feature in the case, which is of serious consequence. People are influenced by prospect of pecuniary advantage to practice deception on railway companies and, in fact, have less scruple in doing

so than in dealings with other parties, from habit as well as resentment. As a matter of simple expediency, therefore, companies should avoid any policy which encourages such practices.

Hence the conclusion that rules restricting the transfer of railway tickets are injurious to the companies, for the following reasons: 1. They provoke strife, with constant discomfiture to their contrivers. 2. The practice of deception is inculcated and is liable to extend to all transactions with railway companies. 3. Business is damaged in direct ratio to the difficulties imposed upon those who seek transportation facilities.

Good policy and good morals always agree. When people ask bread, it is bad policy to give them a stone.

AMERICAN AND ENGLISH LOCOMOTIVES.

BY A MASTER MECHANIC.

[Written for the AMERICAN RAILROAD JOURNAL.]

It is questionable if anything American has been so much misrepresented by the English, and especially the English mechanical paper *The Engineer*, as American locomotives. Whether this is the result of blind prejudice which will not admit the truth, or a want of information as to the facts, is hard to decide, although it will not be far from the mark, probably, to set it down as a fair admixture of both. The general charge is that American locomotives burn from fifty to one hundred per cent. more fuel to perform the same work that English engines do. This charge is loosely made with no attention whatever to the number of tons hauled by our engines.

The writer met an English engineer or "driver" a short time since who is now running an engine in this country, and in a conversation on the comparative merits of American and English engines, the engineer handed the writer a performance slip that he had brought over from England. This slip shows that engine No. 2,280 in the month of September, 1881, ran 2,017 miles and consumed 35 pounds of coal per mile. The train consisted of six coaches and a baggage-van and guards-van, or eight cars. The coaches seated 50 passengers each, were 30 feet long and weighed about 7 tons, 18 cwt., or say 8 tons. The brake or guards-van weighed about 7 tons, 10 cwt., or in round numbers the train consisted of eight cars weighing 8 tons each. As the English ton is 2,240 pounds, the 8 tons per car makes each weigh a little less than 9 of our tons. This would give for the eight cars, 72 tons. If the six coaches were full of passengers they would hold 300 people, and, assuming each passenger to weigh 150 pounds, this would add 22½ tons, or a total of 94½, or say 95 tons. If we now divide the weight of the train in tons into the consumption per mile it will give us a measure of economy with which we can compare American practice; $\frac{35}{95} = .368$ or $\frac{368}{1000}$ of a pound of coal per ton per mile.

Meeting an acquaintance a few days since who is running a passenger-engine on a large road in Ohio, I asked him if he could give me a performance slip of what his engine was doing. He handed me the last one he had received. This slip shows that engine 158 made 6,200 miles in June, 1885, that the engine burned 45.45 pounds of coal per mile, and hauled an average train of a trifle over five cars per train. These trains consist of three passenger-cars weighing 25 tons each and two baggage-cars weighing 18 tons each, or a total of 111 tons. The passenger-cars seat 66 persons, or a total of 198, who, at 150 pounds each, would weigh nearly 15 tons, which added to the weight of the train, makes a total of 126 tons. Dividing the consumption of coal per mile (45.45 pounds) by the weight of the train in tons, we have $\frac{45.45}{126} = .362$ or $\frac{362}{1000}$ of a pound of coal per ton per mile or $\frac{6}{1000}$ of a pound *less* than the English engine is doing. In place of the loose and incorrect assertions of *The Engineer*, which have always been to the effect that American engines were burning 100 per cent. more coal than English engines, we find, that undoctored facts show that the American engine is the most economical. *The Engineer* has frequently asserted that English engines are burning but 22 pounds of coal per mile. On asking for information on this point from the English driver he replied that it could only be done with a very light train, and as an English train is very light as compared with an American train, a very light English train must be light indeed—somewhere about 50 tons—and probably compares with an accommodation-train on an Ohio road that the writer has in mind, which has shown a consumption of but 20 pounds per mile.

The Engineer has gone so far in its blind prejudices as to assert that the American Master Mechanics' Association stated that the consumption of coal by American engines was "from 50 to 100 per cent. in excess of that required by English engines." The facts are that the Association never made such a statement, for want of knowledge of what English engines are doing. This statement grew out of a suggestion by a member or committee that it would be interesting to get an English engine and try her on our roads, in order to find out how she compared with American engines. Such loose and inaccurate statements have done much to place the value of *The Engineer* at a very low rate in this country.

In all English colonies the American engine is prefered to the English engine, although it meets with opposition frequently of a questionable character. A characteristic incident occured on an Australian road—the Adelaide and Nairne Railway—a few years back. In 1880 a prominent American locomotive-building establishment built four engines for this road. These engines had cylinders of 19 x 24 inches with driving-wheels of 60 inches diameter. These engines are capable of exerting a pull on the drawbar of $(19^2 \times 24 \times 100) \div 60 = 14,440$ pounds which would allow of the engine (disregarding her friction) hauling at a slow speed, 2,880 tons on a level. Notwithstanding this, this engine was allowed to stall with *98 tons.* The real cause of this was first, that the engine was American and the locomotive superintendent of the road was an Englishman. The engine had made six miles when she stopped because her grate-bars burned out. In this country the burning out of a new set of grate-bars is considered an equivalent to the incapacity on the part of the engineer in "burning" the engine, that is, allowing the water to get so low as to scorch the crown-sheet. An investigation by the builders of the engine developed the facts that the engine was taken out and coupled to the train with her ash-pan *solid* with cinders from her previous trip. Through intentional neglect the ash-pan was not cleaned out; and as no air could enter the ash-pan or find access to the under side of the grates, they very naturally

melted out, and on account of this piece of vandalism the locomotive superintendent reported the engine as a failure. The locomotive superitendent's report was that the engine stalled with 98 tons, although she was capable of hauling 2,880 tons. It is a well-known fact that English cars pull much heavier than American, as will be shown further on, but even if every car in the train had solid blocks of iron to slide on in place of wheels, the engine would have hauled them, had she not have been subjected to the most outrageous treatment. The writer was informed by an English railway official who had traveled extensively in this country, that he found English engineers, etc., much less intelligent than American. He said the want of success which the Westinghouse brake experienced in England, when first introduced, was due entirely to a want of intelligence on the part of the engineers and others who had the matter in charge. The cost of an American engine in Australia is £2,700, while an English engine costs but £2,000. But the report of the chief engineer of this road shows that the American engine is capable, and does perform twice the amount of work of an English engine, so that £2,700 worth of American engines is equal to £4,000 worth of English engines. From the same report it appears that in January of that year, the American engine ran 2,781 miles, burning 54 pounds of coal per mile, or a cost of hauling 100 tons one mile, of 1.86 pence. Owing to the prejudice against this engine it is probable that she really performed 100 per cent. better. The same report shows that the cost for hauling 100 tons one mile by the English engines was 2.73 pence, or making proper allowance for prejudice, 3.73 pence. The total cost per 100 tons hauled one mile, including engineers pay, etc., was 2.56 pence for the American engine, while for the English engines, this total cost is given at 4.33 pence. With proper allowance for prejudice and ill-treatment of American engines it will be close to the mark to say that the American engine was better by from 150 to 200 per cent.

The improvement in economy which would follow the use of American cars on English colonial roads is shown by the fact that in "Colburn's Locomotive Engineering" (an English publication treating of English engines and cars), is found the following formula for ascertaining the resistance per ton, where R is the resistance and v the velocity; $R = 12+(v^2 \div 114)$. This gives for a speed of 50 miles per hour, a resistance of 34 pounds per ton. Prof. Dudley found with his dynagraph-car that American trains of 300 tons and upward at 50 miles per hour gave a resistance of but 10 to 11 pounds per car. Applying these figures to an English train of 400 tons at 50 miles per hour, (4,400 feet per minute) we have $400 \times 34 = 13{,}600$ pounds and $(13{,}600 \times 4{,}400) \div 33{,}000 = 1{,}813\frac{1}{3}$ horse-power as necessary to haul the English train. The American train requiring but 10 pounds per ton would require $400 \times 10 = 4{,}000$, and $(4{,}000 \times 4{,}400) \div 33{,}000 = 533\frac{1}{3}$ horse-power, to which may be added, on an allowance of 20 pounds per ton of engine, if it weigh with tender 70 tons, $70 \times 20 = 1{,}400$, and $(1{,}400 \times 4{,}400) \div 33{,}000 = 186\frac{2}{3}$ horse-power, or a total of 720 horse-power as compared with $1{,}813\frac{1}{3}$ horse-power for the English train. In view of these facts it would appear that *The Engineer* would do well to investigate the value of American engines and cars on their merits, and give its readers some reliable information devoid of prejudice.

RAILS AND TRACK LABOR.

THERE is a feeling among not a few American trackmen, which for the time being has almost as much force as if it were an undeniable thing, that a 60-lb. rail is about the dividing line between light and heavy rails for fairly heavy traffic, that a 65-lb. is something good enough for any one, and that to use a 70 or 80-lb. rail is something like wasteful extravagance on any but roads of the very heaviest traffic. In fact, it has recently been contended with some authority that there is no economy at all, but rather a disavantage, in using heavier rails than 60 or 65 lbs.; that only a certain fixed amount, say ⅜ to ⅞ inch can be worn off the top of any rail without so destroying its surface as to make it worthless for good track, and that for this and other reasons buying anything more than a 65-lb. rail is a waste of money which might better be devoted to track labor for maintenance of surface. It is even contended that heavier rails make the track too rigid.

That there is great force in one of these arguments at least, if its truth be admitted, is clear. If rails tend to wear so rough that they will only stand a certain fixed amount of wear before becoming worthless for this cause alone, the futility of increasing the section to obtain longer wear is evident, and it would hardly be asserted that the greater stiffness and strength alone of the heavier section would justify its greater cost. So, too, if rails are to batter down at the joints within a few months after laying, as some poor rails do, so as to need removal for that cause alone before they have sustained any considerable wear, extra money for extra weight of section is plainly wasted. But neither of these causes of failure will be generally admitted to be other than exceptional. Even fairly good rails do not batter at the joints, nor do they wear rough, to such an extent as to cut short their life much below that due to normal wear, under ordinary circumstances.

Barring these causes, and neglecting as trivial the objection that any practicable rail can make track "too rigid," there remains only this question: Where is money for improving track best expended, in increasing the rail-section or in more track labor?—and there are certain considerations which seem to indicate quite strongly that this question has not been always considered with sufficient independence and care, and that the worst sins against sound economy are committed, not by those who buy 30 or 40 or 50-lb. rails for poor thin-traffic roads, but by those who buy 60 or even 65-lb. rails for prosperous and busy roads, with the idea that they are thereby taking the most economical course to obtain a first-class track. First-class track, it is true, can be and is obtained with such rails, but whether saving 5 to 10 lbs. per yard on such heavy rails does not waste more money than it saves and more than proportionate savings on lighter rails and for poorer roads, is another question.

That there is an immense gain in strength, stiffness and durability in increasing the weight of even the heavier rails we have already seen in a recent issue, but as the discussion referred to seemed to be directed, even more than it really was, to distinctively light rails of less than 50 lbs. per yard section, we may repeat the conclusions there reached in respect to the sections without now giv-

ing the grounds for them. According to the conclusions there reached:

	Increases			
Adding to a 60-lb. rail	Weight.	Stiffness.	Strength.	Durability.
10 lbs. per yard.........	16.7 p. c.	36 p. c.	26 p. c.	83 p. c.
20 " " "	33.3 "	79 "	54 "	167 "

the weight varying directly with the section, the stiffness as the square of the weight per yard, the strength as the 3-2 power, or square-root of the cube of the weight, and the durability being determined by assuming (1) that about half the weight of any section is in the head, (2) that with rails very light for their duty only $\frac{1}{5}$ of the head can be worn away before the rail becomes unserviceable, and (3) that a heavier rail may at least be worn down until the head is no heavier than that of the lighter rail when unserviceable.

That the three qualities which are desirable in a rail, strength, stiffness and durability, are much more cheaply purchased in the heavy sections than in the lighter sections, is clear enough from this statement. It will be seen that the additional stiffness gained costs less than half as much, the additional strength but little more than half as much, and the additional durability only one-fifth as much, and we need hardly repeat that, inasmuch as the function of the rail is not only to support the load from tie to tie, but to relieve the strain at joints and the load on low or imperfectly bedded ties, there is always use for all the strength and stiffness there is in an ordinary rail-section. The stiffer the rail the less perfect need be the supports of the road-bed for equal excellence. The only question is whether this needed support cannot be more cheaply obtained by putting a little more work into the surfacing.

Strenuously as this view is maintained by some entitled to a hearing, it hardly needs more than to present a few contrasting figures strongly to indicate, at least, that it is more an impression than a well-founded belief.

To increase the weight of rail 10 lbs. per yard requires, in round numbers, 16 tons per mile, costing, at the even figure of $30 per ton, $480 per mile, the interest on which is:

At 5 per cent.	At 10 per cent.	At 20 per cent.
$24.00.	$48.00.	$96.00.

Equal to a cost *in cents per train mile*, assuming various numbers of trains per day each way, of—

	Cents per train mile		
	At 5 p. c.	10 p. c.	20 p. c.
1 train per day....................	3.29	6.58	13.16
2 " "	1.64	3.29	6.58
10 " "	0.33	0.66	1.32
20 " "	0.16	0.33	0.66

It would seem as if no demonstration were needed beyond this table to show that on a road of any considerable traffic, the stability gained by adding 10 lbs. per yard to the weight of a 60-lb. rail would give far more for the money invested, at any probable rate of interest, than the expenditure of an equivalent sum annually on additional track labor for lining and surfacing. On a road running 20 trains per day, even if it cannot get money at less than 10 per cent., the interest charge of $48 per year per mile amounts to but 0.33 cent per train-mile, whereas the common expenditure on raising and surfacing, ballast, etc., is about 10 cents per train-mile. Therefore the extra 5 lbs. per yard has only to save less than 3⅓ per cent. of track labor to be a paying investment. It seems probable at once that more than that might be saved, and yet maintain equal condition even when the rail was a tolerably heavy one.

It will make the justice of this conclusion clearer to consider for a moment the opposite extreme of light-traffic roads. As respects such roads, especially those built at great cost for capital, the case is not so clear. In fact, for the extremes of their traffic and scant capital, say one train per day and 20 per cent. cost of capital, it seems almost clear that it will not pay to increase the rail beyond what safety requires, as the cost of interest on even 5 lbs. per yard extra weight of rail will in that case be 6.58 cents per train-mile.

But, premising that this extreme case can but rarely be approached in practice, because (1) there are few even of the lighest traffic roads which do not run more than one train each way per day, and (2) few roads are so poor that, if the case is properly presented, they cannot raise a moderate additional capital for betterments which, whatever the profit on the enterprise as a whole, will return 20 per cent. profit on their own individual cost; it may be questioned, from the results of experience, whether even in this extreme case the extra weight of rail is not the best use which can be made of the money. The very least which can possibly be spent on mere track-surfacing and maintenance, and keep it in fairly safe condition for the passage of one train per day, is from $100 to $125 per mile, with $80 to $100 additional for ties, or say $200 in all, excluding perhaps $100 more for yards and miscellaneous. The cost of the 5 lbs. per yard extra weight, even at 20 per cent. interest on capital, is only $48 per year, for which slight increase of one-fifth or one-sixth in the interest charge on rails we obtain an average increase, in a very light rail, of fully 50 per cent. in the three elements of strength, stiffness and durability. Granting a road to be so poor that no increase whatever in total charges can be borne for any betterment beyond absolute necessities, however great, is it certain that so great a difference in the stability of the rail will not enable one-fourth of the otherwise minimum track expenditure to be saved, while yet leaving the track as safe and good as before? It is a fairly even balance, indeed, under this extreme supposition; unless the rails were very light indeed it probably would not pay to increase it; but it is difficult to escape from the conclusion that under any ordinary conditions of traffic it plainly will pay to use a tolerably heavy rail before relying on track labor to make up by better surfacing for its deficiency of strength, simply to save a slight additional investment of capital; and if so, as the traffic increases up to a comfortable average, as to 6 or 8 or 10 trains each way per day, there becomes an immense economy in using heavy rails to save track labor, so much so as to indicate strongly that the very curious similarity in weight of rails used on all roads in this country above the poorest class, despite the great differences in volume of traffic, is due, not so much to the use of too heavy rails on our light-traffic roads as to the use of far too light rails for true economy on our more important lines, as for instance 60 or 65 lb. rails on trunk lines which would be acting more wisely to use 70 or 80 lb. rails. The difference is, however, that such lines are rich enough to stand the resulting loss, whereas a poor road which permits its poverty to destroy it by buying an over-light rail, cannot. Some of our more prosperous lines have recently begun to break through this rule by using what are now called very heavy rails, but the exceptions are not yet so numerous as to do more than prove the rule.

There is an apparent objection to this line of argument; that it assumes the cost of track labor to be very nearly so much per *train-mile* instead of per mile of road whereas in fact, it is often stated, it does or ought to vary more nearly with the distance than with the traffic, so that whether there are twenty or thirty or forty trains per day passing over track, it must be in about the same condition, and hence must cost about the same sum per mile to maintain. From this it must follow that it is not fair to divide up the interest charge on extra weight of rail among a large number of trains, and thus reduce it to trifling proportions, while assuming a nearly fixed cost *per train* for lining and surfacing.

The answer to this objection is that we can only base action on the facts which appear. Perhaps the maintenance charges ought to vary more nearly with distance than with traffic, but as a matter of fact they do not. This interesting and important fact we cannot now attempt to establish, but as it is both interesting and important we shall do so in a following number.—*Railroad Gazette,*

GENESIS OF A CAR-WHEEL.

It is estimated that there are ten million car-wheels whirling over this country at the present moment, conveying millions of passengers and more millions of tons of freight to and fro across the continent at an average speed of 25 miles an hour for passengers, and often 40 miles. How many of the hurrying multitude who trust their lives on the rail, pause to consider the admirable mechanism by which these great results are accomplished? How many complex problems have been solved in the gradual evolution of the old-time stage-coach into the modern iron horse and his train?

Take, for example, a car-wheel, one of the simplest parts of a railway-train; it is merely a round piece of iron, and, as we generally see it, covered with dirt and grease, having nothing attractive or ornamental in its appearance, and seemingly gross in its construction; yet that smaller and more valuable disk, known as "Uncle Sam's" double-eagle, which issues from the mint, glittering like a mirror, does not involve in its manufacture more intricate and, in some respects, more delicate manipulation than this same gross car-wheel.

The most important difference between a car-wheel and any ordinary machine or apparatus made of cast-iron, is the fact that the "tread" of the wheel, viz., that part which runs on the rail, is quite different in character from the "plate" or main body, though cast from the same metal in one pouring. The tread or rim is actually harder than the finest steel, thus enabling it to resist not only the wear upon the steel rail, but the still more destructive grip of the brakes; and its average "life" is not far from 100,000 miles of service. The process by which the hardening of the tread is produced is called "chilling," and is somewhat analagous to the "tempering" of steel. A mould is made in sand from a wooden pattern, the moist sand is pressed by the moulder against both sides of the pattern with a hand rammer, and it is then sufficiently tenacious to enable the pattern to be carefully removed without destroying the mould. This "sand mould" is enclosed in a ring made of iron called the "chill mould," whose internal face has been previously turned upon a lathe to form the tread and flange of the wheel, and numerous air-passages, or vents, are made through the sand with a long needle to permit the gentle escape of highly explosive gases which are formed when the molten iron is running into the mould. The stream of glowing fluid-iron quickly fills the hollow space between the upper and lower sides of the sand mould, and running to the edge comes in contact with the iron ring, or chill mould, and this being a much better conductor of heat than the sand mould, chills the rim of the casting, not only congealing the iron instantly, but causing it to crystallize to a depth of about half an inch in beautiful parallel filaments, as white as silver and nearly as hard as diamond. The portion of the wheel forming the plate or sides cools more slowly, is not "chilled," and its texture is the same as that of ordinary cast iron. If the wheel is made of a mixture of iron which is too highly sentitive to the chilling influence, it will be too brittle for safety and too hard to permit of boring the hole in the hub into which the axle is to be fitted. If, on the other hand, the metal does not possess sufficient chilling property, the tread of the wheel is too soft and soon becomes flattened, and then the wheel is useless. The margin between these extremes is very small, and it is the daily aim of the wheel-maker to steer between this Scylla and Charybdis.

It must not be supposed that all irons posses this chilling property, for it is a comparatively rare one, and little is known, even among the most expert iron masters, of the causes which produce it. Very recently some light has been thrown upon the subject by the aid of chemical anaylsis, and scientific investigation will doubtless reveal still more clearly what is as yet but dimly seen. Pig-iron is not a simple substance, but is in reality an alloy composed of at least half-a-dozen different elements, each one of which helps to stamp its character upon the metal. It has been found, for example, that the substance silicon, which is always present in pig-iron, exerts an extraordinary influence upon its chilling power, and a variation of less than 1 per cent. of silicon is sufficient to make or mar a car-wheel; indeed, it has happened that an entire day's work of several hundred men has been spoiled by an excess of one-half of 1 per cent. of this substance creeping undetected into the mixture. The method of analyzing the iron to ascertain the proportion of carbon, phosphorus, manganese, sulphur and silicon which it contains is too complicated to admit of a general description; suffice it to say, that a few grains of a sample are reduced to fine powder, weighed upon an extremely sensitive balance, treated with acids and other "re-agents," or tests, by which means each element is separated from its partners, and its weight ascertained. In a wheel-foundry the iron is commonly melted in a large furnace called a cupola, capable of melting fifty or more tons a day. Anthracite coal is used, and a strong blast of air from a pumping-engine creates an intense heat. As the iron melts, it collects in a pool at the bottom of the furnace, from which it is drawn into an immense ladle or cauldron, sometimes holding fifteen or twenty tons; from this it flows into smaller ladles, holding just sufficient molten iron to make one large wheel.

Great skill is required in pouring the iron into the mould. It must be just the right temperature and it must be allowed to run into the mould with just the right force; otherwise a bad casting is the inevitable result.

After the wheels are taken out from the moulds, they require to be thoroughly annealed as they are subjected to an immense strain due to the more rapid cooling of the chilled tread. For this purpose they are either put into pits previously heated, or buried in hot sand, where they are allowed to remain for several days. In this way the molecules of the metal gradually arrange themselves in new positions and the strain is entirely removed. The sand which adheres to the wheel is then brushed off, and the wheel tested for strength by heavy blows with a sledge-hammer, and for hardness on the tread by chipping with a highly-tempered cold-chisel; in this way any "soft spots" may be readily detected and the wheel accordingly condemned. There are, in fact, no less than 27 distinct "diseases" so to speak, which a car-wheel is liable to contract in the course of its manufacture, and it must pass a rigid inspection in the quarantine or "cleaning shop" before it receives the required guarantee of its maker that it is "free from all defects."

Finally, having obtained a clean bill of health from the inspector, the wheel passes to the machine-shop where the hub is bored out, the axle fitted in by hydraulic pressure (of 15 or 20 tons) and the wheel and its mate are ready to start out on their long journey. If they are well matched they should roll along through their whole life without jarring, and, barring "accidents," will often travel 150,000 miles before becoming completely tired out.

The chilled cast-iron car-wheel is a purely American invention, and the method of annealing, which alone made this process practicable, was devised by a manufacturer in this city as long ago as 1847, since which time between one and two million wheels have been made in the works established by him, and have been shipped to all parts of the world where the shriek of the locomotive whistle has penetrated.—*Philadelphia Public Ledger.*

Durability of Cross-Tie Timber.

In an investigation of this subject made by Mr. F. B. Hough for the Department of Agriculture, some interesting facts are brought out. The relative importance of the various kinds of timber for railway purposes are reported in the following order: Oaks, pines, chestnut, hemlock, cedars, tamarack, cypress, elms, ash, cherry, black walnut, firs, spruce, beech, locust, redwood, maple, butternut, coffenut, mulberry and mosquit.

The average durability of oak, as reported in 32 cases, is 7.4 years, while the average price of each cross-tie is 41.2 cents. The kind of oak is not specified. For white oak the average durability in 152 reported cases is 7.3 years, and the average price in 173 cases is 40.6 cents. The average duration of a post oak tie is 7 years, and average price 33 cents. For burr oak, durability, 7.4 years; price, 37.3 cents. Rock oak showed an average durability in 18 cases of 7 years; price, 42 cents. In the case of red oak 5 years is the average durability, with an average cost of 27 cents. Chestnut oak is more durable, showing an average lifetime as a tie of 7.1 years; cost 28 cents per tie. Black oak shows an average durability of 4½ years; average price, 43 cents.

Long leaf or southern pine will last on an average 6½ years; average cost per tie, 37 cents. White pine has about the same durability with less cost, the latter showing an average of 31½ cents per tie.

Cedar shows the greatest average durability, being 11.8 years, with average cost of 34 cents, but it is too soft to bear heavy freightage and for that reason is not much employed in railway construction. Red cedar is more durable than white cedar, being in the proportion of 11 to 7. Cypress shows greater durability than white oak, the former showing an average of 8.7 years. White ash and black ash rot very quickly, the former in 4.3 years and the latter in 3.8 years. Cherry is a durable timber when used as cross-ties, running from six to ten years, All woods are much more lasting when hewn than when sawn.

The redwood of California makes very durable ties, lasting over eleven years, but allowance must be made for the fact that they are used on the Pacific roads, in a dry climate, where the causes inducing decay are not so great as in the States east of the Rocky mountains. The growth of the redwood is very slow. Trees fifteen years old have a diameter of only ten or twelve inches and will make about three ties. When younger than this the wood is not durable. The redwood of the Santa Cruz mountains furnishes the best ties, it being much heavier and denser than when grown further north. The average cost of redwood ties is 40 cents. The total length of railway track in the United States is approximated at 150,000 miles. Assuming that the average durability of ties is seven years and the distance apart is three feet, there will be 2,640 to the mile, which is rather under than over the actual number employed, making the total number in use 396,000,000. Estimating one-seventh to be replaced every year the annual demand to keep up the present railways will reach 56,571,428. Supposing that an acre will supply 100 ties, which is a liberal estimate, it will require 565,714 acres annually to furnish the ties required by the existing lines of railways. For each mile of railway there will be an annual demand for 377 ties, requiring the cutting off of 3.77 miles. It will require thirty years on an average for trees to grow large enough for making cross-ties. The acres that must be kept in timber and growing will be 16,971,420 for supplying ties to the railway lines now in existence.

The increase in railway mileage, estimated by two decades, is about 4,150 miles annually. To construct the railways that will probably be built in the next ten years 109,560,000 ties will be demanded, the product of 1,095,600 acres of woodland. Allowing thirty years as the period of growth for ties, this would add 3,286,801 acres to the timber reserve for railways alone, making a total of 18,996,570 acres as the needful reserve. Evidently this question is one demanding reach of statesmanship and a careful preservation of our present timber supply. The time is not far distant when one of the largest items in the construction expenses of our railways will be the one for cross-ties.

Painting Ironwork.

The point of prime importance, says the *Painters' Magazine*, is the actual condition of the surface when ready to receive the first coat. Upon this point rests the success or non-success of subsequent applications, for if not in proper condition no paint will prove permanently preservative. Now the best state is that where there has been formed upon the surface of the iron a film of black

oxide which has been, while hot, thoroughly permeated by and incorporated with a resinous or tarry covering. This covering insures perfect success, and its thickness may be increased from time to time by additional coats of paint. If, however, a layer of hydrated oxide (ordinary rust) be once allowed to form, the successive coats of paint will fall off, their separation from the iron being merely a question of time. During this time, also, the rust has been spreading under the paint. An instance of this may be seen after out-door riveted work has been in place for some time. Usually all the riveting is done before the final painting is begun, each rivet-head in the meantime being exposed to a damp atmosphere; the paint begins to peel off the rivet-heads long before it leaves the adjacent plates, and when this occurs nothing but thorough scraping will give the paint a chance to adhere again. So slight are the differences of manipulation which determine whether a given piece of work shall or shall not rust away, that they may all be found in the different methods of manufacture pursued now and formerly. Taking the case of a piece of ornamental ironwork, which in so many instances has come down to us in unimpaired beauty and condition, it would be now probably forged in detail in one part of a factory, drilled, filed and fitted in another, and when completely finished, be painted in three coats of best oil paint. Formerly the smith who forged the work punched the necessary holes at the same time, fitted his various pieces together as he went on, completing each piece as he proceeded, doing all the work with his hammer, and, to quote an old book of directions to good smiths, brushing his work over with linseed oil and suspending it for some time over a strongly-smoking wood fire. This will give at once a sort of elastic enamel coat, perfectly adherent and calculated to preserve the iron to the utmost. Of course, ironwork today is not made to undergo any such preparatory process, and the consequence is that we find it very difficult to produce good results in painting on iron surfaces. But it is pretty well established that the very best finish coat for iron is found in red lead, upon which any desired shade of lead paint may be placed with the best possible results.

Car-Coupling Tests by the Master Car-Builders' Association.

THE Master Car-Builders' Association, through its secretary, has issued the following notice:

The executive committee of the Master Car-Builders' Association, acting in accordance with the general instruction given by the Association at the last convention, will make a public trial of automatic freight-car couplers, at Buffalo, N. Y., on Tuesday, September 15, 1885.

The executive committee will be guided by the results of their trial in recommending several forms of couplers to the railroad companies for further test in actual service. They will watch the behavior of those selected couplers until one month prior to the next convention of the association, when they will prepare a report, and may recommend for universal adoption one or more different forms of automatic freight-car couplers.

All parties desirous of presenting freight car-couplers to the consideration of the Master Car-Builders' Association are invited to participate in this trial.

The following requirements must be complied with:

The couplers must be attached to each end of two freight-cars—preferably box-cars—both cars must be forwarded, freight prepaid, to J. S. Hammond, Agent, New York, Lake Erie and Western Railroad, Buffalo, N. Y. Any additional charges for switching, etc., will be charged against the cars before they are billed home, and should be paid by the consignee or party interested in the device. Full drawings and specifications, together with letters-patent, and any opinions on the device that may have been given by the Eastern or Western Railroad Association, or by the courts, and also a statement of the numbers and initials of cars equipped with the coupler and already in service, must be forwarded to the executive committee of the Master Car-Builders' Association, care of M. N. Forney, secretary, 71 Broadway, New York, prior to September 15. All cars intended for this trial should be on hand in Buffalo, by Saturday, September 12, so that the committee can have a full list of them.

The committee will not consider or investigate the merits of couplers represented only by models, drawings or other descriptions. An imperative condition of the trial will be that couplers submitted to the committee *must be applied to two cars* so that they can be tested at the time and place named.

The executive committee is not prepared to assist inventors or owners of patents on car-couplers in procuring cars to be equipped and delivered at Buffalo ready for trial. Negotiations of this character must be conducted directly between the owners of the couplers and the railroad companies. It will also be necessary for parties furnishing cars for this trial to arrange direct with the railroad companies for their return.

Notice of intention to take part in the trial giving the numbers and initials of the two cars that will be forwarded, should be addressed to Edwd. B. Wall, Columbus, Ohio, or to M. N. Forney, 71 Broadway, New York, who will also answer inquiries with reference to the proposed trials.

Railroad commissioners of the various States will be invited to be present at this trial.

By order of the Executive Committee.

M. N. FORNEY, Secretary.

A Ship-Railway in Nova Scotia.

A BANGOR dispatch says that prominent railway and shipping men in New Brunswick and Nova Scotia are just now interested in a project which is intended to revolutionize the coasting traffic and to develop the resources of the north shore of New Brunswick and Prince Edward Island. It is the construction of a ship-railway across the isthmus between Northumberland Straits and Chignecto Bay, the northern arm of the Bay of Fundy, by which a saving of over 300 miles can be made in a voyage from the north shore of Prince Edward Island to Boston or other ports in the United States. By the natural route vessels from the Gulf of St. Lawrence are obliged to make a circuit of Nova Scotia, which is a great obstacle, not only by reason of the distance, but also on account of the dangers of navigation along its rocky coast. Work has already been commenced on the road, and good progress is being made, the chief engineer being John Fowler, who constructed the underground railway in London, and who is now engaged on the bridge over the Firth of Forth. A London syndicate has signed a contract to furnish the money required for carrying out the project.

Railway Building in the West.

IN answer to the plenteous talk of overbuilding of railway industries, says the *Railway Reporter*, it has been pointed out that the northwest beyond the Mississippi has just begun to develop its use of railway facilities. What has been done in the east, and especially in the cluster of western States lying north of the Ohio and east of the Mississippi is to be repeated in the territory west of the last named river. The five States—viz., Ohio, Michigan, Indiana, Illinois and Wisconsin—include a territory of about 200,000 square miles, with about 30,000 miles of railway, or about one mile of line to each 8.3 square miles of territory. In the section including Minnesota, Dakota, Iowa, Nebraska, Wyoming and Montana, in which the large portion of the area in soil is similar to and quite as productive as the division named east of the Mississippi, are over 600,000 square miles, with about

18,500 miles of railway, or one mile of line to each 32.8 square miles. This country, especially Dakota and Western Nebraska and Wyoming, is now undergoing the same process of development witnessed in the States east of the Mississippi twenty-five years ago. The needs of the newer section for rail facilities are now no less pressing than those of the older section when first brought into cultivation. To afford the same facilities for transportation to the trans-Mississippi section as are enjoyed in the Ohio group of States will require about 70,000 miles of railway, or about 50,000 miles in addition to what has already been laid.

Railways in India.

AT present the total mileage of railways open for traffic in India is, according to the *Railway World*, only 12,014, which is insignificant and insufficient when compared with the enormous area, population, wealth, and possibilities of the empire. There are 15,560 miles open, under construction, or sanctioned, it is true, but the slightly larger total does not materially affect the comparison. Up to December 31st, 1884, the total capital outlay on the Indian railways and connected steamer services amounted to £155,450,366 (at the conventional 2s. the rupee), of which £105,319,144 had been expended by guaranteed companies, £42,924,893 on State railways, £3,783,065 on native States' lines, and £3,433,259 on assisted companies' lines. The gross receipts during 1884 amounted to £16,066,225, and the working expenses to £8,156,157, the total net earnings yielding a return of £5 1s. 9d. per cent., as against £6 13s. 6d. in 1883. The total number of passengers carried was 83,815,119, against 65,098,953 in 1883, and the aggregate tonnage moved was 16,663,007, against 16,999,264 tons in 1883. Dullness in the grain traffic diminished the receipts from goods, but of the 45 items of traffic, 27 show increases, so that the outlook may be deemed very hopeful.

The Convention of the Master Car-Painters' Association.

THE sixteenth annual convention of the Master Car-Painters' Association will be held at Toronto, Canada, opening on Wednesday, the second day of September, 1885, at 10 o'clock A. M., and continuing in session until Friday evening, September 4th, or until the business of the convention is complete. The committee of arrangements have visited Toronto, and selected the Rossin House as the headquarters of the association. Parlors have been secured at this hotel in which to hold the convention.

A general invitation is cordially extended to master car and locomotive painters throughout the United States and Canada to attend the convention, and also to become members of the organization.

The following list of subjects will be brought before the convention:

1. Why do Paints and Varnishes Crack, and What is the Reason that Cracks in the Latter are Usually at Right Angles to the Grain of the Wood? A. P. Sweet, Detroit, Lansing and Northern Railroad, Ionia, Mich.
2. The Inside Finish of a Passenger-Car, from the Foundation to the Finish, including Wood Head Linings. T. F. Page, Laconia Car Works, Laconia, N. H.
3. The Paint-Shop of Fifty Years Ago, and the Paint-Shop of to-day. D. D. Robertson, Michigan Central Railroad, Detroit, Mich.
4. Is a Car-Body Color Composed of One Durable Pigment more Durable than a Color Composed of Two or more Pigments? C. E. Copp, Boston and Maine Railroad, Lawrence, Mass.
5. A Few Thoughts on the Outside Painting and Varnishing of Railway-Cars. Wm. Davis, Canada Southern Railway, St. Thomas, Ont.
6. Is it Practicable to Prepare the Painting of a Passenger-Car, up to the First Coat of Body Color, before Placing on the Car; also on Freight-Cars up to the Last Coat of Color? Jos. Murphy, Louisville and Nashville Railroad, Louisville, Ky.
7. Piece Work in the Railway Paint-Shop. F. S. Ball, Pennsylvania Railroad, Altoona, Pa.
8. What is the Best Method of Cleaning Brass and Plated Car-Trimmings? E. L. Fetting, New York and New England Railroad, Norwood, Mass.

The First Railway in America.

IN the course of a paper read before the Franklin Institute, bearing the title "Transportation Facilities of the Past and Present," Mr. Barnet Le Van corrects the commonly received statement that the Granite Railroad, built at Quincy, Mass., in 1827, by Gridley Bryant, for transporting stone for the Bunker Hill Monument from the granite quarries of Quincy, was the first railway built in the United States. On this point he presents interesting testimony to prove that, far from being the first, the Granite Railroad was really only the fourth in order of precedence in the United States. We quote from that portion of the paper relating to the subject as follows:

"Railroads were also first introduced in Pennsylvania. In September, 1809, the first experimental track in the United States was laid out by John Thomson, (the father of John Edgar Thomson, who was afterwards the president of the Pennsylvania Railroad Co.), civil engineer of Delaware County, Pa., and constructed under his direction by Somerville, a Scotch millwright, for Thomas Leiper, of Philadelphia. It was 180 feet in length, and graded 1½ inches to the yard. The gauge was 4 feet, and the sleepers 8 feet apart. The experiment with a loaded car was so successful that Leiper in the same year caused the first practical railroad in the United States to be constructed for the transportation of stone from his quarries on Crum Creek to his landing on Ridley Creek, in Delaware County, Pa., a distance of about one mile. It continued in use for 19 years. Some of the original foundations, consisting of rock in which holes were drilled and afterward plugged with wood to receive the spikes for holding the sleepers in place, may be seen to this day."

Telegraphy in the United States.

THE United States has more than three times as many telegraph lines, double the number of telegraph offices, and forwards twice as many telegrams annually as any other country on the globe. The figures for the United States are: Length of line, 163,940 miles; number of offices, 14,402; messages sent last year. 57,942,247. Russia

comes next in miles of lines, with 53,736, but is far behind in number of offices and telegrams sent. France, Germany, Austria and Australia rank ahead of Great Britain in miles of line, having 45,878, 45,070, 31,131 and 21,831 miles respectively, though Great Britain with 31,345,861 telegrams, forwarded, sends a few more than one-half the number sent last year in the United States. In number of offices in Europe, Germany with 7,366 has the most and Bulgaria with 37 the least.

The English Railway Commission.

THE eleventh annual report of the English railway commission has been issued. Fourteen cases were brought before this court during 1884. The commission also approved five working agreements between the railway companies, a fact which leads one journal to remark that the companies "recognize that it offers them manifest advantages as arbitrator in their own disputes, for out of the fourteen cases seven related to disputes between the companies themselves, and only five referred to complaints by traders against railway companies. This is different from the experience of the early days of the commission, when nearly all were complaints of freighters." During the past nine years 125 cases have been presented for judgment, and 47 working agreements have been approved. Four of the cases referred to for 1884 were concerned with terminal charges.

A Great Railway Bridge in Australia.

A GREAT railway bridge 3,000 feet long is to be built over the Hawkesbury river, New South Wales, Australia. The soundings appear to show that the foundations for piers must be sent down to a greater depth than any ever sunk in the whole history of engineering, the water in some places being 77 feet deep, and in others, where the water is 45 feet deep, the mud and sand are 125 feet deep, making 175 feet in all, to sink the piers below tide. This bridge is to be for double lines and will cost over £400,000. Sir Saul Samuel, of London, on the part of the government, has named a board of engineers to meet in London to examine and report on the plans and tenders sent in by the bridge builders. The board named consists of Sir John Hawkshaw, C. E., Col. Douglas Galton, and Mr. W. W. Evans, M. I. C. E., of New York.

The Smallest Locomotive.

THE Central wharf railway-shops, at Pensacola, Florida, have recently made the smallest locomotive ever built in the United States for regular service. The engine is for a 20-inch gauge road. The cylinders are 5 by 8 inches; driving-wheels, 12 inches in diameter; 4¾ feet is the greatest height above the rail, and it has 97 tubes, 1½ inch in diameter. The tank holds 180 gallons of water, and the coal-bunkers have a capacity of 250 pounds. The whole machine is only 9½ feet long, 7½ feet wide, and weighs in working order 3½ tons. It has attained a high rate of speed, pulls 15 loaded cars, weighing about 45 tons, and handles them easily. A pressure of 80 pounds is carried.

A Singular "Cut."

FREIGHT is hauled on most of our railways at such a low rate that craft on free water-courses can hardly compete with rail tariffs. Under this state of matters, says the *National Car-Builder*, it is curious to read that a railway has been compelled to lower its rates, owing to the competition of ox teams. Yet, in this year of grace, that is what the Canadian Pacific has been forced to do. The reduction was to $30 per ton for a haul of 160 miles. Some railways in the United States would be glad to get one of the thirty dollars for the same haul.

Freight-Rates in Mexico.

THE Mexican Government has officially notified the Mexican Central Railroad that it must comply strictly with the terms of its concessions and the provisions of the general railway regulations forbidding inequalities of of freight-rates, and that special through rates from the United States cutting under the Mexico freight tariff cannot be permitted. The government also warns the company that it shall investigate cases of alleged freight-rate cutting, and if proved legally the fixed penalties will be enforced.

Railways in Chili.

THE republic of Chili now owes on account of her railways $24,870,000. In 1883 these railways earned a revenue of $6,516,049 on a capital of originally less than $60,000,000, and which is now reduced to $22,450,000. Good management and liberality on the part of the government have brought about this splendid financial result.

The Cost of Stopping a Train.

EVERY stop of a train costs money to a railway company. Recent statistics kept on a certain trunk line showed that during a given year the 350 daily trains made 7,000 extra stops every twenty-four hours, the traffic being largely suburban. Experiments showed also that each stop cost 42 cents, reckoned largely in extra time to employés who for that number of stops aggregated 350 extra hours per day, making a total loss to the company of nearly $50,000 a year.

Keely Surpassed.

IT is stated by the *Railroad Gazette* that at one of the fairs of the Massachusetts Charitable Mechanics' Association in Boston, the management forbade any fires in the building; and, as a consequence, exhibitors of portable engines considered that they were deprived of opportunities of showing the operation of their class of engines. One exhibitor showed resources equal to the occasion, for he connected the exhaust pipe of one engine in his exhibit to the boiler of another of his engines, removed the safety valve, and connected the flywheel by belting to the shaft which was kept in motion by the main engine of the Exhibition. This method of driving an engine furnished a supply of compressed air in the second boiler, whence it was used for motive purposes. Soon the manager learned that these portable engines were in operation, and assuming that the regulations concerning

fire were necessarily violated, sent a worthy colored messenger to examine and report the facts to him. After looking these engines over very carefully, he reported that they were running the engines in question with the "northwest wind or something or other." A group of laborers were examining the engine, and one of them gave his opinion that "cold steam and no fire was the greatest invention yet."

Specific Gravity of American Woods.

ACCORDING to *Wood and Iron*, of the four hundred and thirteen species of trees found in the United States, there are sixteen species whose perfectly dry wood will sink in water. The heaviest of these is the black ironwood (*Condalia ferrea*) of Southern Florida, which is more than thirty per cent. heavier than water. Of the others, the best known are the lignum vitæ (*Guaiacum sanctum*) and mangrove (*Rhiziphora mangle*). Another is a small oak (*Quercus grisea*), found in the mountains of Western Texas, Southern New Mexico, and Arizona, and westward to the Colorado desert, at an elevation of five thousand or ten thousand feet. All the species in which wood is heavier than water belong to semi-tropical Florida or the arid interior Pacific region.

A Railway in China.

THE Chinese Government has contracted with a Manchester, England, firm for the construction of a railway from Takou, at the mouth of the Hoen-Ho, on the Yellow Sea, to Tong-Chow, on the Pet-Ho, a point about twenty-five miles east of Pekin. The railway will be about one hundred miles long, and will give Pekin a direct and easy communication with the Yellow Sea. China is now engaged in raising in Europe a loan of 100,000,000 florins to be expended in internal improvements.

Railways in Indiana.

THE State Board of Equilization of Indiana reports the extent and value of the railways of the State as follows: Length of main track, 5,445 miles; valuation, $39,509,509. Second main track, 68 miles; valuation, $402,260. Side track, 1,051 miles; valuation, $2,505,958. Rolling-stock, $11,095,428; improvements on right-of-way, $1,470,838. The figures for 1883, as reported, were as follows: Main track, 5,429 miles; valuation, $39,150,690; second main, 68 miles; valuation, $405,580; side, 990 miles; valuation, $2,709,948; rolling-stock, $11,345,113; improvements, $1,-429,356. The total increase in the valuation of railway property in the State is $349,439.

The Electric Light on Railway-Cars.

THE Pennsylvania Railroad Company continue their experiment with lighting their cars by electricity from Brush storage batteries. They use the lights on a train running between Altoona and Pittsburgh, and the arrangement has worked satisfactorily. The storage batteries are charged in the company's shops by connection with a Brush dynamo-electric machine. It takes about nine hours' running to charge the batteries with sufficient electricity for the round trip. The intention is, should the plan be found advisable for general use on through trains, to establish electric plants at different stations for charging the batteries.

The Longest Draw-Span in the World.

THE Passaic Rolling Mill and Bridge Works, of Paterson, are building what will be, when finished, the longest draw-span in the world. It is to be four hundred and thirty feet long, will weigh about five hundred tons, and consist of iron and steel in the proportion of three to two. The machinery for latching, lifting the ends, and turning the draw is all to be worked from the center of the span, and is fitted to be operated by either hand or power. The turn-table is rim-bearing, turning on fifty wheels eighteen inches in diameter. The diameter of the drum is twenty-five-and-a-half feet. It is for the new bridge which the Minnesota and Northwestern Railway is constructing across the Mississippi River at St. Paul. The length of the entire bridge will be 1,430 feet.

THE largest boiler constructed for any locomotive at the West Albany shops of the New York Central road is now under way. It has a 52-inch shell, two inches larger than any other, made of $\frac{7}{16}$ inch iron. There will be 228 tubes, twenty-eight more than in any other boiler, and it will carry 160 pounds of steam. The boiler is 16 inches higher than the usual run, and all told weighs over eight tons.

PREPARATIONS are being made on the New York Central road for scooping water instead of making stops at the tanks. The engines of fast freight and passenger-trains are to be supplied in this way. The troughs will be constructed first at a point west of Palatine Bridge, and will be 1,200 feet in length. Scooping attachments have already been affixed to several of the road's locomotives.

THE fourth annual meeting of the American Forestry Congress will be held in Horticultural Hall, Boston, Mass., beginning on September 23d, under the auspices of the Massachusetts Horticultural Society, in conjunction with the New England Agricultural Society, the Massachusetts Board of Agriculture, and the Society for the Promotion of Agriculture.

THE six great French railway companies estimate that they will have to purchase additional rolling-stock next year to the aggregate value of £2,247,200. It appears from the detailed estimates prepared upon the subject that the largest orders will be given out by the Paris, Lyons and Mediterranean, and the Orleans companies.

THE Pennsylvania Company recently presented its employés, at Pittsburgh, with a library, reading-room, assembly hall and bath-rooms.

AN underground line is to be built in Naples, the largest city in Southern Europe. The stations, etc., are to be lit by electric light.

FRANCE is stated to possess more suspension-bridges than any country in the world.

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Principal Contents of this Number.

A BAD YEAR FOR RAILWAYS.

THE year 1884 was not one that affords pleasant retrospection. It was a year characterized by dullness in trade and a number of unsavory financial failures that should lead us to forget it as soon as possible. Naturally it was not a good year for railways, but it is doubtful if it was thought to be as bad as subsequent investigation has demonstrated. "Poor's Manual" for 1885 as usual conveys the minutest information concerning railway progress during the past year and the information is as valuable as it is depressing. Wherever there should be an increase there is a most discouraging decrease, and wherever, in a healthy business year, there should be a decrease there is an increase.

Briefly summarized, there were at the close of 1884, according to Mr. POOR, 125,379 miles of railway in the country of which but 3,977 miles were constructed during the year, showing an increase of but 3.17 per cent. The share capital of this mileage equaled $3,762,616,686 as against $3,708,060,583 in 1883, an increase of but 1.4 per cent., and the funded debts of all the lines equaled $3,669,115,772 as against $3,500,879,914 in 1883, an increase of $168,235,858, or of nearly 5 per cent. This is a sorry showing and we are not surprised at the statement that "the country is now about at its lowest depth so far as railroads are concerned." In the face of this meager showing it is hard to believe that 40,000 miles of railway were constructed in this country during the five years ending with 1883.

In the matter of traffic earnings there is little improvement in the bad showing made in railway construction. The gross earnings of all lines from which returns were received during 1884 amounted to $770,684,908, a falling off of $53,088,016 from the previous year; a decrease of about 6.4 per cent., or of $798 per mile. The net earnings of all the lines in 1884 equaled $268,106,258, a falling off of $25,261,027 from the net earnings of the previous year; the rate of decrease being about 9 per cent. In the matter of passenger and freight transportation there was a slight increase, but, of course, a decrease in the amount paid per mile for transportation; and it is shown that the decrease in earnings was wholly due to the reduction in rates charged. Had the rates for passenger and freight transportation prevailing in the year 1883 been maintained in 1884 there would have been a materially better showing, and instead of a decrease from the gross earnings of the previous year there would have been an increase of $3,752,447; not a large increase it must be confessed, but, nevertheless, a margin in the right direction. All around the falling off is properly stated as phenomenal, and considering the number of leading lines in receivers' hands there is at present a dismal blueness in the railway atmosphere. The true state of our railway industry can only be obtained by a

thorough inspection of the Manual, but it takes a very little investigation to reach the conclusion that there is something wrong with our railways. Possibly "over-production" hassomething to do with it, and railway construction has been pushed more rapidly than was warranted by the needs of the country; possibly, and probably, absurd competition has contributed to the depression, and certainly unscrupulous and bad management are responsible, in great part, for the poor showing of the year.

RAILWAY JOURNALISM.

SOME of our esteemed contemporaries are exercised over apparent slights to the dignity of the railway press. They indignantly repel suggestions to the effect that their publications are not essential to the management of railways, and boldly avow that they are factors of the greatest importance to the railway world and exercise a powerful influence both for weal and woe. The "weal" part of it we will admit, but we do not comprehend the influence for "woe" that our worthy brothers of the press boast of wielding. We hold to the opinion that a railway publication is a trade paper of the higher class, offering benefits to the industry in whose interests it is published, and receiving in return adequate compensation in being furnished a field of action in which it can flourish and obtain sustenance. It is to the interest of railways to encourage railway publications and extend them a helping hand, and it is to the interests of the railway publication to labor faithfully for the advancement of railway interests. It is a simple case of mutual benefit, and the railways and the railway publications should work harmoniously for common ends.

Certainly it seems to us not only impolitic and contemptible for railway papers to insinuate that they can injure the industry whose interests they are supposed to foster, but also absurdly untrue. While we believe in the usefulness of railway publications, we candidly admit that were they one and all to suspend publication, the railways of the country would still continue in active operation. The injury which the publications could inflict is merely of a negative character in depriving the railways of the benefit of mediums of communication, and interchange of opinions. Any attempt on the part of a railway paper to injure the character and financial standing of a road would meet with lamentable failure, even if there were several grains of truth in the allegations that might be made.

In the connection of railways with railway journals the question of passes plays a most important part. Several of the publications assume that an annual pass is not only a recognition of the service rendered to a road by the journal, but a perquisite which should be furnished as a matter of course. From this view we beg leave to differ. While it is perfectly proper for those conducting railway publications to apply for complimentary transportation upon any railway, the granting of such an application is an act of courtesy on the part of the railway official and should be regarded as such. It is an act of courtesy for which no return is demanded and the recipient is not under a weight of obligation to return the favor; but it is one of those little amenties of intercourse which do not come under the strict rules of business, and should a request of this sort be denied we fail to see that the applicant has a cause for grievance. To be sure he may consider with truth that the rejection of his application was not courteous and that the particular official to whom he applied was not overly obliging, but these little incidents have nothing to do with the actual business of a railway publication.

Again, unfortunately, there are too many trade publications whose sole aim and object is to extort money in one form or another from the trade which it represents, and to derive sustenance through a species of blackmail, but fortunately the railway papers are free from this fault almost throughout the whole extent of railway journalism, and we regret the utterance of the merest insinuation that the publications have it in their power to visit reprisals upon the roads who for one cause or another do not recognize the value of that branch of the trade. The only proper way for railway journalism to be conducted is as a business—a business where no favor is sought and where the general interests of railways are alone consulted, irrespective of whether or not the usefulness of the publications have met with recognition by particular roads. If a few roads do not perceive the advantages accruing through the publication of a number of journals devoted to railway interests, these roads are more to be pitied than blamed.

EDITORIAL NOTES.

A VALUED contributor writes us as follows:

"In the last issue of the JOURNAL it is stated that "Uncle Gad Lyman," recently deceased, was, on the authority of his brother engineers, the oldest locomotive engineer not only in the United States but in the world. This is not true. The undersigned in the year when Lyman claims first to have handled a throttle (1839) was running the mail-train on the Petersburgh and Richmond Railway, being at that time unquestionably the *youngest* engineer of a locomotive in the world, not being seventeen years of age."

The cry is still they come. Verily the oldest engineer multiplyeth on the face of the earth and he even resembleth his compatriot, the "oldest mason." It still remains, however, for the above record to be beaten.

* * *

OUR enterprising contemporary, the *Railway News*, foams with rage and soundly cudgels our unhappy friend "Superitendent," the author of two recent articles in the JOURNAL on the subject of promotion in railway service,

and even the JOURNAL comes in for a few sounding thwacks. Our serenity is disturbed by an insinuation that our publication is "alleged" to be devoted to railway interests. Grievous as is the allegation, we shall endeavor to survive it. We wrote our friend "Superintendent" asking him if he wished to reply to the *News*, in the full knowledge that he would view the ferocious attack made upon him more in jest than in anger, and he sends us the following in reply:

"Under the circumstances I think it would be well to close the discussion, at least for the present. The subject is an interesting one, and I would have been glad to have continued the discussion of it if it could have been conducted in moderation and in courtesy; but, I confess, when my opponents resort to personal abuse, I am silenced. That is a weapon I am not fond of employing. . . . . The amusing part of it is that the whole animus prompting the fiery onslaught of the *News* is found in the fact that I heedlessly alluded to it as "another railway publication." Now I can say honestly that I meant no slur in so characterizing it, but I really do not see how I can apologize for my thoughtless language. The only apology possible would be one similar to the famous apology made by a character in one of Captain MARRYAT's novels, who upon being overheard to remark that his superior officer was "not fit to throw guts to a bear," was forced to make an apology before the ship's company, which he cheerfully did, retracting the assertion and remarking that the gentleman *was* fit for that pleasing occupation. Now I cannot apologize for calling the *Railway News* another railway publication without saying that it is *not* another railway publication, which, to tell the truth, would do injustice to that exceedingly readable and progressive publication toward which I bear no malice, but which unfortunately has not the respect for me that I have for it."

* * *

THE Convention of Master Car-Painters to be held in Toronto next month, is an event of interest in railway annals and expectancy awaits upon the deliberations of the artists of the rail. The papers to be read at the convention are unusually numerous and varied, and it will give us pleasure to put them before the readers of the JOURNAL as quickly as possible.

* * *

THE fastest run ever made is reported by the New York, West Shore and Buffalo road, a special train on that road running from East Buffalo to Frankfort, a distance of 205.1 miles in four hours, maintaining a speed of from 75 to 85.7 miles per hour. This is something like, but we are a little disposed to doubt the statement that it was the fastest run ever made. Nevertheless it is pretty fast for these times. In years to come, we confidently look to see a hundred miles per hour reached, GEORGE STEPHENSON to the contrary notwithstanding.

* * *

THERE is something peculiarly childlike and bland in the extended argument published in an English railway journal, urging that railways should be represented in Parliament. If the writer should sojourn long with us he would discover that in America, so public opinion seems to indicate, the difficulty is to keep railways out of legislative bodies.

MASSACHUSETTS is generally at the front in all matters appertaining to railways, and we are not surprised at the agitation that is there being made in that State against the indiscriminate blowing of locomotive-whistles. In fact, we regard the locomotive-whistle very much as we do the church-bell. It was very useful in its time, but now with the vast improvement in railway-signals and safety-switches the use of the whistle is very much circumscribed.

* * *

A NOVELTY in the way of expositions will be the American Exhibition to be held in London next year. As an exclusively "Yankee" show given on foreign soil, patriotism should stimulate us to show our British cousins what we can do three thousand miles off, and, doubtless, there will be more genuine interest taken in the exhibition than if it were to be given here at home.

* * *

VERILY we are flooded with notices of Expositions and Exhibitions. In addition to the Philadelphia Novelties Exhibition and the American Exhibition in London, and the "second edition" of the New Orleans Exhibition, we are further reminded that the Permanent Exhibition of the United States of America will open in Rome under the auspices of the ministers of Agricultute, Industry and Commerce of Italy, and of the consul-general of the United States.

MR. J. D. SIBLEY, architect and builder, and Mr. A. O. Kittredge, editor of *Carpentry and Building*, have compiled a little work entitled "The Practical Estimator," which is published by David Williams, at 83 Reade street, New York. The work is a key to "The Handy Estimate Blanks," published by the same house; and together they furnish a most valuable assistant to the carpenter and builder. Every item is considered and the builder is saved much time in forming his estimates.

Dixie, a southern monthly magazine published by the Dixie Company, of Atlanta, Ga., makes its appearance with every indication of a prosperous future. The first issue is an excellent one and its contents are of varied interest, while a special announcement promises a second number of unusual merit.

The Philatelic Journal of America is received, published by E. M. Hackett, of St. Louis. As its name indicates it is a publication devoted to the interests of stamp collectors.

IN their *World Travel Gazette* for August, the World Travel Company, of 207 Broadway, New York, offer a number of attractive routes to the tourist at reasonable rates.

The St. Louis Medical Journal for August, contains a number of articles of interest to laymen as well as to the profession.

WITH its September number, *Outing* completes its sixth volume. As usual the publication calls for unqualified praise.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

IS IT TO BE THE STREET-RAILWAY OF THE FUTURE?

ELSEWHERE in this department we print extracts from a notice recently issued by the Bentley-Knight Electric Railway Company, of this city, and upon reading these extracts the question naturally presents itself: Is the electric road to be the street-railway of the future? We are not disposed to assume that the Bentley-Knight system is the only practicable system of electric roads in existence, but it is certain that the company controlling this system are able to point to one road in successful operation in Cleveland, and to exhibit figures showing the advantages of their system over those of horse and cable roads. It is not to be supposed that this company advance arguments in the shape of estimates that cannot be sustained; and their offer to build and equip a road and demand no payment until their claims are substantiated, is certainly one calculated to inspire confidence in their assertions.

The estimates of the Bentley-Knight Company are based upon the cost of construction and maintenance of an average city road, operating five miles of double-track and running forty cars. In the question of cost of construction as between a horse, cable and electric road, it is seen that the horse road calls for an outlay of $162,000; the cable road, $414,750; while the electric road comes in between the two with an outlay for construction of $344,100. In the matter of annual expense of motive-power, the horse and cable roads reverse their relative positions in the above estimates, the horse road costing annually for motive-power $102,960, by far the greatest sum, the cable road, $75,590, while the electric road calls for an expense for motive-power of but $30,551.50; less than one-third the cost of motive-power of the horse road, and less than one-half that of the cable road. Thus the saving in annual expense of motive-power in the adoption of the Bentley-Knight system over that of horse and cable roads, is in the first instance, $72,408.50, and in the second, $45,038.50. It is furthermore shown that the cost of changing an existing horse road to an electric road is $257,100, and the cost of changing an existing cable road to an electric road, $113,600, while the saving in motive-power annually effected is, in each case, over one-fourth the total cost of changing the road to an electric road, or a return of over twenty-five per cent. per annum from the amount expended to adopt the electric system.

It is fair to assume that these estimates have been carefully computed, and are the results of months of careful study by experts and engineers. We confess they startle us not a little. While it is quite possible that the Bentley-Knight system will, in time, be greatly improved, and that other systems equally good will be introduced, the above-mentioned estimates speak for themselves and again we are prompted to ask: Is the electric road to be the street-railway of the future?

THE Board of Aldermen of New York City have granted a franchise to the Fulton, Wall and Cortlandt Street Railroad Company, and at last the city will be furnished with a long-needed means of cross-town communication in the lower portion of the town. We trust this road will be but one of several of its kind, for easy communication between the North and East rivers is of immense importance. The granting of this franchise is an indication of the rapidity with which public opinion changes. Two years ago it would have been deemed absurd to construct a surface road crossing Broadway on a level at any point down town, and the suggestion of a road on Broadway itself would have been scouted.

UTILITY IN STREET-CAR PAINTING.

BY A CAR-PAINTER.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE car-painter has two tasks to perform: he must turn out a handsome job and a useful job. Not only must a street-car be artistically painted, but *usefully* painted, and this is seldom done. The car-painter is not responsible for this, for the prevailing mode of painting street-cars is to make them as gaudy as possible with little reference to useful features. Now a handsomely painted street-car is a handsome thing, and considerable ingenuity has been called into play in painting panels and sides of cars. They are painted of every hue, in red, white, blue, green, yellow, purple, plaid, and in combinations of various sorts, but the occasion is rare when the side panels of a car are devoted to their proper use—to bear the destination and route of the car. The destination and route of the car are generally painted in small letters just under the roof, which may be read with ease at a distance of a hundred feet, but not more; whereas the side panel affords a chance for them to be painted in letters a foot long and visible a block off. If the public were consulted it is likely that they would prefer

to dispense with the elaborately painted car, and be furnished with one that carries its destination and route with it in sufficient clearness to be read at a reasonable distance. The inside of a car is the place for decoration; not the outside. Everything on the outside should be devoted to utility.

A friend of mine has devised an ingenious system of car-painting which he declares will be the system of the future. He presupposes that all the roads of a large city are under one management, or, at least, have decided upon a common system of painting; and upon this assumption he has devised a system of street-car painting that applies to every line of cars in one city. All cross-town cars are to be painted in one general style, and the up-and-down-town cars in another. These cars are also lettered to indicate whether they run east and west, or north and south, the letters "N. & E.," "S. & W.," being painted in bold figures on each side and end of the cars. Presuming that the termini of a road are points of interest, or stations of railways, he has further devised a system of disks on which appears the precise time at which the car is due at the terminus toward which it is running, these disks being shifted at the end of each half-trip. The number of the car which is generally painted in large figures on the side of the car, and which the public care little about, is relegated to the front and rear dash-boards of the car which are practically of little use for other purposes.

In the interior of the car he has utilized the small panels generally devoted to advertisements for the insertion of cards giving information as to the connections made with other roads. Thus the first panel from the rear end of the car will show the first connection, and the second panel the second connection, etc., the two sides of the car being furnished alike with these cards.

In this general system every latitude is allowed for ornamentation and originality apart from the side exterior panel, which is reserved for a uniform style of painting. The painter can do as he pleases with the rest of the car, but that panel is reserved for utility and not for ornament.

It is doutful if my friend's plan will meet with general adoption, despite his hopefulness and confidence; but in the direction of usefulness much can be done in the way of street-car painting. At least, the various roads in this city should adopt a general system of painting their cars that would prevent confusion of different lines, and there is no reason why the route and destination of the car should not be painted where it can be most conspicuous—on the side of the car. Handsome lettering is just as artistic as scroll-work and a great deal more useful.

THE BENTLEY-KNIGHT ELECTRIC RAILWAY.

THE Bentley-Knight Electric Railway Company, of 115 Broadway, New York, have just issued a general notice to street-railway companies, from which the following extracts are taken.

"The Bentley-Knight electric tramway having been in commercial use on the East Cleveland Horse Railroad, at Cleveland, Ohio, since August, 1884, and having successfully solved the problem of city surface roads by experiments conducted in the heat of Summer and during the extreme cold and heavy snows which, at Cleveland, distinguished the Winter of 1884—5, and the company, having completed its arrangements with the Rhode Island Locomotive Works for manufacturing upon a large scale, is prepared to enter into contracts to build and equip electric tramways, or street-railways, complete in all details, either entirely new and over unoccupied routes, or to replace horse, steam, or cable roads now in operation—surface, elevated, or underground. The Bentley-Knight Electric Railway plant consists of a stationary source of power, engines, boilers, and dynamo-electric machines, which may be located at an extreme end of the line, at tide-water, or at a railway station, wherever property or fuel is cheapest; a conduit running from the source of power to and along the whole length of the line, containing stationary and permanent conductors, which receive and distribute the electric current to the motors placed under the cars and geared to the axles; and a depending conductor which, passing through a slot in the conduit and sliding in contact with the stationary conductors, maintains unbroken connection with the source of power. All the parts are of the most substantial and enduring character.

"The direction and speed of the car are controlled at will by the driver from either end, the power consumed being always proportionate to the speed. Movement from rest to a speed of fifteen miles an hour in either direction is accomplished by the movement of a single lever. The driver can therefore proceed slowly, almost imperceptibly when required, and take any desired speed to recover lost time. The operation of the lever requires no exertion and the ordinary horse-car drivers are employed indifferently for both duties.

"The conduit which contains and protects the electric conductors is kept perfectly clean by brooms attached to some of the cars. The facility and perfection with which the small conduit is kept clean commends the system to the approval of sanitary boards.

"Each car is entirely independent of any other, and any car, generator, or engine may break down without interrupting the traffic. A car disabled through accident would be pushed to the depot by the succeeding one. An engine or dynamo may be cut out for any reason and at any time, by increasing the speed of others. The independence of the motors and expansibility of the motor power renders the system wholly independent of horses or other reserve. The power consumed is proportioned to the number of cars operated, and (neglecting interest on plant) one car may be run with nearly as great economy as twenty.

"Cars may be stopped as quickly as desired, may reverse to avoid a block, and be replaced on the track (if derailed) by the motor without injury.

"Powerful sweepers and snow-ploughs, driven by motors supplied from the same conductors, serve to keep the road in good condition during the heaviest winter storms. The same cars which run in city streets at from six to eight miles an hour, may be speeded to fifteen or twenty miles on suburban extensions, thus saving change of cars and accomplishing rapid average time on long lines, or lines uniting villages or neighboring towns.

"In applying the Bentley-Knight electric system to a horse-road in operation, it is not required to suspend the traffic. A line may be extended at any time without difficulty.

"The machinery on the car has no reciprocating parts; there is therefore no lateral hammering, the motion is smooth, and the wear and tear greatly reduced. The absence of machinery along the line requiring attention and oiling, and the automatic brushing of the track and conduit, contribute to diminish the cost of labor.

"Although the body of the car is supported upon the motor-truck, it may be so adjusted that closed bodies may be used in winter and open in summer, and closed cars with motors may pull open cars without motors.

"The Bentley-Knight Electric Railway Company submits comparative estimates of the prime cost and expense of construction and maintenance of electric, cable, and horse railways, and estimates for changing horse and cable roads into electric roads with stated economies. The figures will vary somewhat in different localities, inasmuch as material, labor, fuel, and animals vary in value, but are approximately accurate for New York City. In considering relative cost it must be borne in mind that both the cable and electric systems may "double up" cars without materially increasing the cost for power or labor, while the horse-lines must frequently double up power to carry the single load. This is not taken into the account, but it consitutes a formidable item."

The Bentley-Knight Company also furnish the following comparative estimates as to cost of construction and maintenance of horse, cable and electric roads:

No. 1.

COST OF BENTLEY-KNIGHT ELECTRIC TRAMWAY.

Estimate on cost of building and equipping an electric tramway operating 40 cars over 5 miles of double-track; headway 2½ minutes; average speed 6 miles an hour.

Track, 10 miles, at $5,000	$50,000
Cars, 40, at $800	32,000
Conduit, 10 miles, at $11,660	116,600
Steam-power plant	27,500
Building and foundation	11,000
Dynamos	44,000
Motors, 40, at $1,200	48,000
Engineering	15,000
	$344,100

ANNUAL EXPENSE OF MOTIVE-POWER:

Coal, 5 tons per day, at $2.50	$4,562.50
Engineer and assistant	1,500.00
Firemen (3)	1,800.00
Lubrication	540.00
Interest on motive plant, 6 per cent. of $246,100	14,766.00
Maintaining plant, 3 per cent	7,383.00
Total	$30,551.50

No. 2.

HORSE TO ELECTRIC (B-K. SYSTEM).

Estimate on cost of changing an existing horse tramway into an electric tramway; 40 cars and 5 miles of double-track.

Conduit, 10 miles, at $11,660	$116,600
Steam-power plant	27,500
Building and foundation	11,000
Dynamos	44,000
Motors, 40, at $1,200	48,000
Engineering	10,000
	$257,100

Annual expense for motive-power as by estimate No. 1, $30,551.50.

No. 3.

CABLE TO ELECTRIC (B-K. SYSTEM).

Estimate on cost of changing an existing cable road into an electric tramway; 40 cars and 5 miles of double-track.

Conductors, 10 miles, at $1,000	$10,000
Insulators	9,600
Dynamos	44,000
Motors, 40, at $1,200	48,000
Engineering	2,000
	$113,600

ANNUAL EXPENSE OF MOTIVE-POWER.

Coal, 5 tons per day, at $2.50	$4,562.50
Engineer and assistant	1,500.00
Firemen (3)	1,800.00
Lubrication	540.00
Interest on motive plant, 6 per cent. on $113,600 + $414,750, original cost of cable plant	31,701.00
Maintaining plant, 3 per cent	15,850.50
	$55,954.00

No. 4.

COST OF HORSE TRAMWAY.

Estimated cost of laying and equipping a horse tramway having 5 miles of double-track and operating 40 cars:

Double-track, 5 miles, at $10,000	$50,000
Cars, 40, at $800	32,000
Horses, 360, at $125	45,000
Building	35,000
Total cost	$162,000

ANNUAL EXPENSE OF MOTIVE-POWER.

Feeding, replacing, and caring for 360 horses, at $234 per year	$84,240
Interest on investment at 6 per cent	9,720
Maintaining horse-stables' plant	9,000
Total	$102,960

No. 5.

COST OF CABLE ROAD.

Estimated cost of cable road; 5 miles of double-track, operating 40 cars:

Double-track, 5 miles, at $56,650	$283,250
Steam-power plant	25,000
Building and foundation	40,000
Curves	8,000
Driving-machinery and sheaves	7,500
Cars, 40, at $900	36,000
Engineering	15,000
	$414,750

ANNUAL EXPENSE OF MOTIVE-POWER;

Coal	$4,562.50
Engineer and assistant	1,500.00
Firemen (3)	1,800.00
Oiling 2,000 sheaves	4,000.00
Interest on motive plant, 6 per cent. on $414,750	24,885.00
Maintaining wire rope	26,400.00
Maintaining plant, 3 per cent	12,442.50
	$75,590.00

COMPARATIVE SUMMARY.

COST AND MAINTENANCE OF BENTLEY-KNIGHT ELECTRIC, HORSE, AND CABLE RAILWAYS.

ESTIMATE FOR NEWLY CONSTRUCTED LINES.

Cost of horse road	$162,000
" " electric road	344,100
" " cable road	414,750

ANNUAL EXPENSE OF MOTIVE-POWER FOR:

Horse road, table No. 4	$102,960.00
Electric " table No. 1	30,551.50
Cable " table No. 5	75,590.00

ANNUAL SAVING IN COST OF MOTIVE-POWER:

Electricity over horses	$72,408.50
Electricity over cables	45,038.50

The Bentley-Knight Company further offer to construct an electric railway under their system, or to modify an existing horse or cable road to be operated by their system, and will demand no payment for such construction or alteration until a reasonable trial has demonstrated that the electric road possesses all the advantages claimed for it by the company.

Street-Railways in Buenos Ayres.

IN the report of the Municipality of Buenos Ayres for the past year are some interesting figures about street-railways in the Argentine capital, and it is noteworthy that in a total municipal population of about 350,000 people, five street-railways are stated to have carried nearly 23 millions of passengers during the twelve months. The following are the official figures: City of Buenos Ayres Tramway Company, 56 kilometres, 9,954,116 passengers; Anglo-Argentine Tramways, 42 kilometres, 3,886,444 passengers; Central, 25 kilometres, 4,282,032 passengers; Boca, 13 kilometres, 1,915,859 passengers; Belgrano, 12 kilometres, 2,793,864 passengers; total, 148 kilometres; 22,832,325 passengers. The street-railway traffic of the city of Buenos Ayres engages 1,319 employés, 3,063 horses, and 180 cars.

An Elevated Railway in Paris.

A RECENT number of *Science* has the following: Jules Garnier has designed an elevated railway for the city of Paris, which, it is expected, will be in running order in time for the Exposition of 1889. It will be 28,800 metres (about 18 miles) in length, and will cost $10,000,000. The structure will be composed of two tracks, one above the other, on an iron frame. The whole will be 15 metres from the building line, and vibrations will be guarded against by special appliances. The trains will be composed of three American cars, each 14 metres in length, and two platform or open cars. They will run every five minutes for seventeen hours each day, and will have branches connecting with the several railways.

The Brooklyn and Long Island Cable Road.

THE directors of the Brooklyn and Long Island Cable Company have elected Austin Corbin, president; William Richardson, vice-president; N. H. Frost, treasurer; Chas. Bruff, secretary. Work on the road has been commenced. The structure must be in working order in Atlantic avenue, from South Ferry to Flatbush avenue, by October 1st, 1886, and the cost will be $2,000,000.

Novel Elevated Railway.

CAPTAIN MEIGS is busily at work on his new system of elevated street-railway at his works in Cambridge. The locomotive, which is nearly completed, has the cab in front. The experimental passenger-car is to be of iron and will be pushed in advance of the locomotive. It will be cylindrical in form and about 50 feet long. There will be two lines of windows, one for observation and the other near the top to admit light. There will be two rows of revolving-chars on each side and the car will be ventilated by a new invention. The chief peculiarity of the road and rolling-stock is the use of only one rail with only one center post supporting the structure.

STREET-RAILWAY NOTES.

A STREET-CAR which does not require switch and siding on meeting another car has been contrived. The car is kept on the rails by means of a fifth-wheel in front of the others, and catching in a groove between the rails; the guide-wheel is set in a triangular frame on the fore-axle, and when the driver raises this the car readily leaves the rails, and may be drawn over the street pavement in any direction.

AT a recent meeting of the directors of the National Cable Railway Company in New York, William S. Williams was elected president; Homer A. Nelson, vice-president; Thomas W. Evans, treasurer; A. G. Earle, secretary; and Charles P. Shaw, counsel. The company expect to begin laying their tracks inside of three months. The contracts for the work have already been awarded.

THE Thirty-fourth Street Ferry and Eleventh Avenue Railway Company propose to build tracks in this city from Thirty-fourth Street Ferry, East River, along Thirty-fourth street, Lexington, Park and Eleventh avenues to 106th street with several branches and connections.

THE Union Transit Company, of Chicago, Ill., has been incorporated to construct and maintain a line or lines of elevated railway from such points in Chicago to such points outside the city as the company shall determine upon; capital stock, $5,000,000.

A RAILWAY similar to that on Mount Washington is to be constructed on Mount Royal, at Montreal. The road is to be completed by September, and 18 cents will pay for a round-trip ride from any section of the city and the ascent of the mountain.

AN electric railway and power company has been organized in St. Louis, Mo. The projectors of the enterprise say that they are going to operate an elevated or surface railway by means of electrical transmission of power.

OPPOSITION is so strong in Concord, N. H., to the recent authorized use of steam-motors on the street-railway to Penacook that the courts will probably be appealed to. The reason is that the motors frighten horses.

IN the department of New Inventions of this month's JOURNAL are published descriptions of a metallic cross-tie for elevated and surface roads, and an improved construction of street-railway tracks.

WORK was commenced July 1st on the elevated railway which is to be built between Kansas City and Wyandotte, Kan., about two miles in length, to connect with the new cable railway.

A CHARTER has been granted by theWaterloo, Ia., City Council to J. R. Reynolds, of Boone, to build a street-railway in Waterloo.

THE Suburban Street-Railway Company, of Peoria, Ill., has been incorporated with a capital stock of $15,000.

New Inventions.

Provencal's Car-Coupling.

FRANCOIS V. ISOIRE DIT PROVENCAL, of St. Frederic, Quebec, Canada, is the inventor of a novel form of car-coupling which is herewith illustrated and described. The object of the inventor is to provide a device by which any given car in a train of cars can be coupled or uncoupled from one given point—such as the tender of the engine, the brake-van, or any other point at which the operating-gear is located—and the device consists of a shaft journaled to the under side of the car-floor, and to one side thereof, and provided with a tongue-and-fork coupling, so as to couple automatically into line when the cars are brought together. This shaft is provided with a cam or thumb, set at a different angle on each shaft, and so placed as to lift the coupling-pin, which takes the form of a hook pivoted over and outside the center of the shaft and at right angles thereto. The shaft or line of shafts is operated by a crank and a train of wheels upon the tender, the brake-van, or other suitable point in the train. A device regulating the position of the link is also provided, consisting of a spring lift holding up the projecting end of the link, and a projecting bar on the opposite car engaging the lifter and depressing it to lower the link if demanded by the relative position of the two draw-heads.

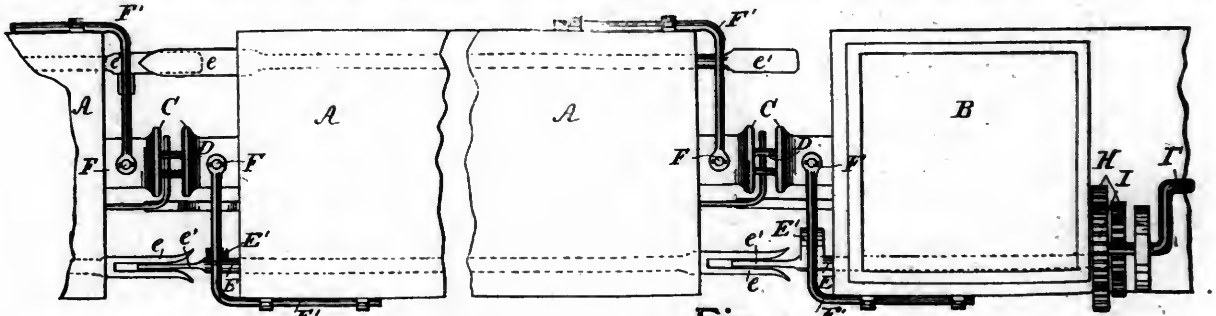


Fig. 1.

PROVENCAL'S CAR-COUPLING.

In the accompanying cuts, Fig. 1 is a plan of a car-platform with the adjoining tender and part of another car; Fig. 2 an elevation of the same, and Fig. 3 an end view of a car, showing the coupling-pin lifted and the link uncoupled.

A A are car-platforms, and B is the tender. C are the draw-heads, and D the coupling-links, all of the ordinary construction. E are shafts journaled to the under side of the car-floor and near the side of the car, one end having a fork *e*, with flaring mouth, and the other end a flat tongue *e'*, intended to enter the fork *e*, automatically coupling the same rotatively. One of these shafts is placed at each side of the car, so that the ends of cars may be reversed. E' is a cam or thumb placed near each end of each shaft, and each secured to the shaft at a different angle from any other in the same train.

F is the coupling-pin, forming the point of a hook pivoted outside of the shaft E, and over the same and the cam E'. The shaft, which is journaled to the tender, (or to the car or point from which it is intended to operate the same), carries a spur-wheel G, geared by a train of wheels H, to a pinion I, upon the axle of which is secured a hand-crank I'. K is a spring lifting-bar holding up the link, and L is an adjusting-bar on the opposite car secured rigidly, and bent to engage the top of the projecting arm *k*, and to depress it, so as to allow the link to drop into the proper position to enter the approaching draw-head.

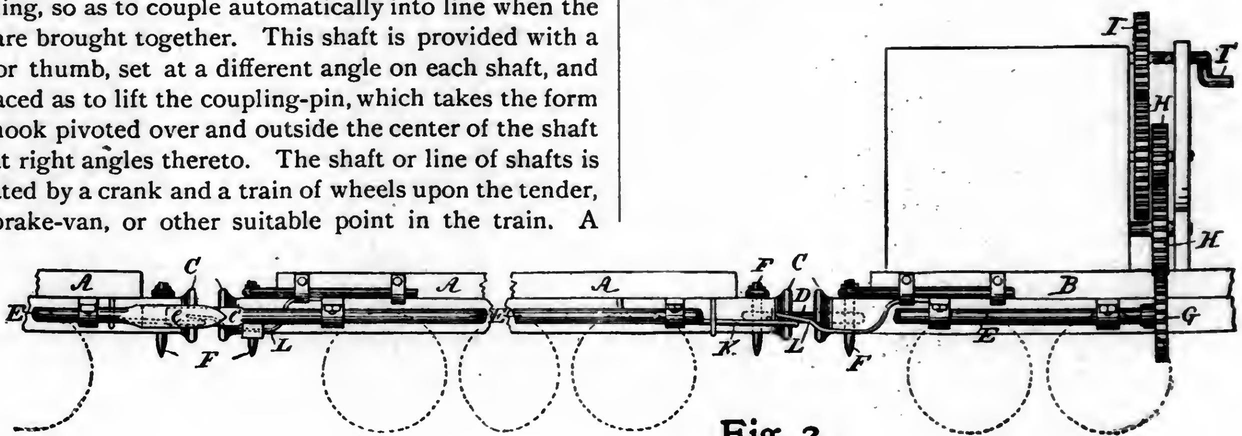


Fig. 2.

PROVENCAL'S CAR-COUPLING.

The device operates as follows: All the cars being coupled, the shafts E, are also coupled rotatively, and the entire line of shafts in one train may be rotated by the fireman or other operative by means of the crank I', and in the course of one complete revolution of the line of the

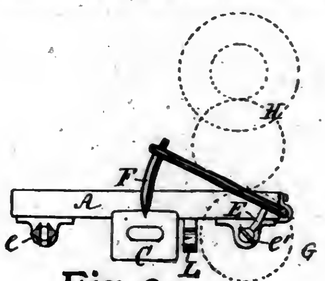


Fig. 3.

PROVENCAL'S CAR-COUPLING

shafts E, all the coupling-pins F, will have been raised and dropped again in succession. When the pin F, is raised, the link is uncoupled and the two corresponding cars may be moved apart.

If any particular car is to be uncoupled, a person will watch the corresponding coupling-pin, and when raised will signal to the person turning the handle I′, who, upon receiving the signal, will cease to work the crank, as the car in question is then uncoupled and may be moved off. In coupling it is only necessary to see that the crank is turned into such a position that none of the coupling-pins are raised out of engagement with the link.

Cowden's Gearing for Reverse-Shafts.

William F. Cowden, of Cumberland, Md., is the inventor of an improved gearing for reverse-shafts the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a plan view of the device, and Figs. 2 and 3 are elevations taken from opposite sides thereof.

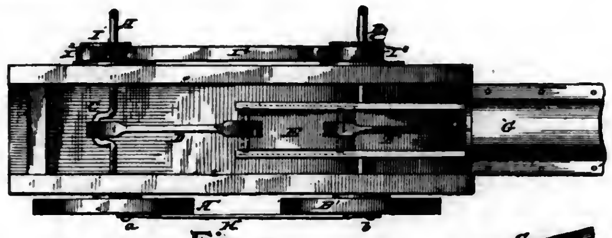


Fig. 1.

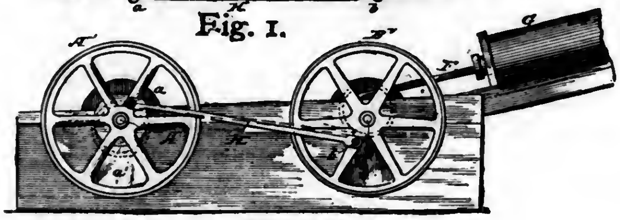


Fig. 2.

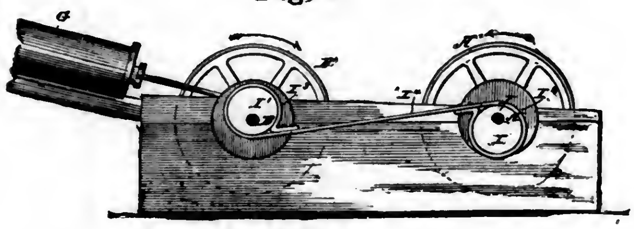


Fig. 3.

COWDEN'S GEARING FOR REVERSE-SHAFTS.

Two twin shafts A B, are journaled in suitable bearings in the main frame, and are arranged parallel to each other. One of these shafts is provided with a crank C, which is connected by a pitman D, with a cross-head E, connected with and driven by the piston-rod F. The steam-cylinder G, may be connected with the steam-generator in any desired manner. On one end the shafts are provided with fly-wheels A′ B′, provided with crank-pins *a b*, and, preferably, with counterpoise-blocks *a′ b′*. The pins *a b*, are connected by a connecting-pitman H, which is so arranged as shown, that the shafts will be revolved in opposite or reverse directions. The motions of the shafts are steadied by the fly-wheels and the added counterpoises.

On the shafts A B, and in line with each other, are fixed eccentric disks I I′, arranged with their longest radii at an angle (approximately a right angle) to the crank-pins *a b*, on their respective shafts. The rings I^2 I^3, of these eccentrics are connnected by a strap I^4. By these eccentrics the cranks will be kept off the dead-center, and they operate to give uniformity to the movement of the machinery.

By this improvement a high rate of speed may be attained, and the machinery will run easily and smoothly. The constructions are light, not liable to get out of repair, and can be quickly and cheaply repaired when necessary.

The device is especially adapted for driving the shafts of twin propellers, but it can also be employed to serve a nnmber of other useful purposes.

Wilder's Safety-Valve.

Henry C. Wilder, of Ashby, Mass., is the inventor of an improved safety-valve especially adapted for locomotives, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a longitudinal section of a safety-valve embodying the improvement; Fig. 2 a longitudinal section taken in a plane at right angles to that of Fig. 1; Fig. 3 a transverse section thereof taken on the line *x x* in Fig. 1, and Fig. 4 a detail view thereof. Fig. 5 is a longitudinal section of a valve, showing a modification; Fig. 6 a sectional detail view of the modification, and Fig. 7 another sectional detail view of the same.

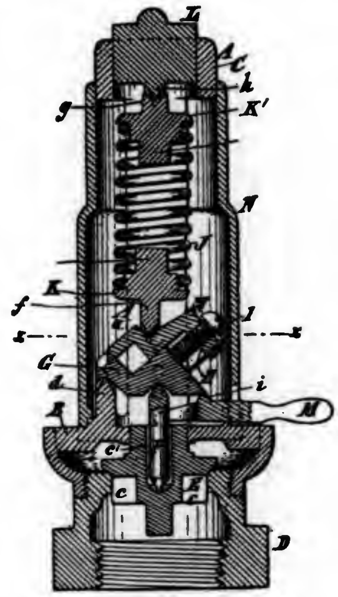


Fig. 1.

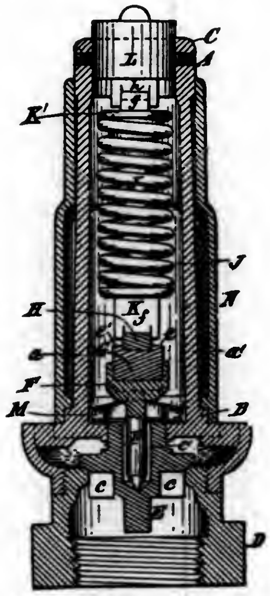


Fig. 2.

WILDER'S SAFETY-VALVE.

A is the frame of the valve by which the various parts are supported. As shown, it consists of two arm-like portions *a a′*, fastened upon a base-piece B, and bearing at their ends a cylindrical rim-like portion C. These arm-like portions, the base-piece, and the ring-like portion are preferably made integral. The base-piece B, is of circular form and hollow. It extends for a considerable distance laterally beyond the arm-like portions *a a′*. This is to afford provision for the escape of steam through apertures *b*, in the upper portion of the base-piece B. A coupling-piece D, is adapted to be screwed into the lower portion of the base-piece B, this coupling-piece being adapted to be secured in any suitable manner to a steam-boiler. Near its upper end the coupling-piece constitutes

a valve-seat for a valve E. Guides *c*, on the valve E guide the valve in its movements. A recess in a projection *c'*, in the upper portion of the valve is adapted to receive one end of a pin F. The valve is further guided in its movements by the projection *c*, which is adapted to move through an aperture in the upper p rtion of the base-piece B. As shown, the outwardly-extending end of the pin F, is bifurcated.

G is a lever fulcrumed near one end upon a fulcrum-piece *d*, forming part of the frame A. About midway in its length the lever G, is recessed upon its under side to receive the bifurcated end of the pin F. It will be seen that when the valve E, is raised from its seat, it operates to move the lever G, through the medium of the pin F. H is an adjustable section of the lever G. It is adapted to be moved backward and forward upon the upper surface of the lever G. Owing to the contour of the upper surface of the lever G, the adjustable section H, may be moved thereon in a direction oblique to the direction of the movement of the valve.

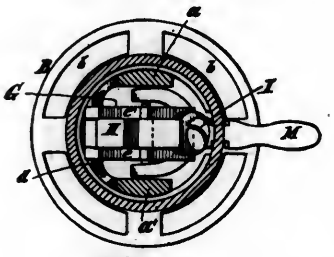


Fig. 3.

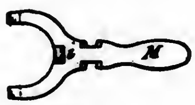


Fig. 4.

WILDER'S SAFETY-VALVE.

A set-screw I, engaging with one end of the adjustable section H, and bearing at its free end upon the main section of the lever G, may be adjusted to vary the position of the adjustable section H, upon the main section of the lever G. Guides *e e'*, on the main section of the lever G, guide the adjustable section H, in its movements.

J is a spring, shown as helical, arranged between the arm-like portions *a a'*, of the frame A. Bearing-pieces K K', are arranged one upon each end of the spring J. The bearing-piece K, is provided with a projection *f*, upon its lower side. Such projection is preferably knife-edged at its lower extremity, and is adapted to bear upon the upper surface of the adjustable section H, of the lever G. The bearing-piece K', is provided upon its upper surface with a projection *g*, adapted to receive a knife-edged projection *h*, upon the inner end of a cylindrical plug L, fitting within the rim-like portion C, of the frame A, and secured therein by screws or otherwise. The plug L, may be adjusted inwardly and outwardly to vary the resistance of the spring J. The knife-edge may be arranged upon the bearing-piece and the projection which receives it upon the plug, if desirable.

The lever G is combined with a device whereby the valve may be opened at pleasure. This device, as shown, consists of a lever M, having a bifurcated end extending between the arm-like portions *a a'*, of the frame A. The bifurcated arms of the lever pass one upon each side of the pin F, and so as not to interfere with the rising of the valve. A projection or rib *i*, upon the upper surface of the lever M, is shown for acting against the lever G. By manipulating the lever M, the valve E, may be raised from its seat. N is a cylindrical case or shell adapted to inclose the parts. It may be moved on and off longitudinally at pleasure.

Steam entering the coupling-piece D, operates to raise the valve E, from its seat. Force is thereupon exerted upon the lever G, by means of the pin F, which force the spring J, has a tendency to counteract. As the lever G, is raised, however, it operates to oscillate the spring J, in one direction, thus shifting the point upon the lever where the resistance of the spring is exerted, and moving such point of resistance more and more out of the line of application of force exerted by the escaping steam. By this arrangement the tendency of the resistance of a spring to increase, when arranged to receive the application of a force exerted to overcome such resistance in a direct line, is overcome, and the danger arising from sudden and undue increase of boiler-pressure is averted. By varying the position of the adjustable section H, of the lever G, the valve may be set to operate at any desired steam-pressure, as by such variation the resistance of the spring may be increased or decreased.

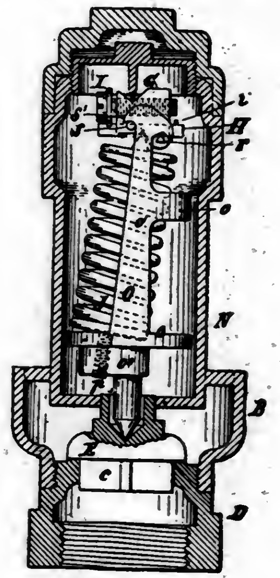


Fig. 5.

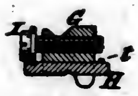


Fig. 6.

Fig. 7.

WILDER'S SAFETY-VALVE.

In the modification shown in Figs. 5, 6, and 7 the frame A, as shown in Figs. 1, 2 and 3, is not needed, and for this reason the shell N, and the base-piece B, are preferably made integral. O is a frame having a circular base portion *o*, and arm-like portions *o'*. A semi-circular connecting-piece o^2, extends between the arm-like portions *o'*, but this may be omitted. In this modification the pin F, is preferably made integral with the frame O. A projection o^3, upon the under side of the circular base portion *o*, of the frame, serves to raise the base portion somewhat above the bottom of the case or shell N.

The spring J, is arranged within the frame O. The lower end of the spring rests upon a bearing-piece K. A screw *p*, passing through a screw-threaded aperture in the projection o^3, on the base portion *o*, is affixed to the bearing-piece K. A bearing-piece K', is arranged upon the opposite end of the spring J. This bearing-piece has a knife-edged projection upon its upper surface adapted to bear upon the adjustable section H, arranged beneath and adapted to be moved backward and forward within guides

upon the lever G. The lever G, is fulcrumed at *r*, upon downwardly-extending parts of the arm-like portions *o'*, of the frame O. Pins or projections *s*, on the lever G, are adapted to abut against projections *s'*, near the upper end of the arm-like portions *o'*, and prevent the lever G, from moving as far in one direction as it would otherwise do.

The set-screw I, has upon it a circumferential rim adapted to engage with a slot in the adjustable section H, of the lever G, whereby, when the screw is turned, it will carry the adjustable section with it in its forward and backward movement. A stop *t*, on the adjustable section H, prevents too great an extended movement in one direction. The knife-edged projection upon the cylindrical plug L, bears upon the upper surface of the lever G. By adjusting the screw *p*, inwardly or outwardly, the resistance of the spring J, may be varied.

The operation of this modification is that of toggle-levers, of which the frame O, constitutes one lever, and the lever G, the other. When pressure is exerted upon the valve it operates to raise the frame or lever O. The lever G, is then caused to be moved against the resistance of the spring J, the result being that the levers are oscillated.

It is claimed by the inventor that his device is simple in construction and easy of adjustment, and is especially adapted for use on locomotives as a gradually-opening safety-valve requiring the manipulation of but one part only, and no secondary adjustment. The safety-valve is also claimed to operate, within practical and reasonable limits, to any desired pressure.

The device is controlled jointly by the inventor and Joel G. Willard, of New York City, to whom he has assigned one-half the patent-rights.

Miller's Nut-Lock.

FRANK L. MILLER, of Indianapolis, Ind., is the inventor of a new form of nut-lock, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a view of a bolt passing through a couple of boards with a nut, and the nut-lock in place on the bolt, the boards and nut being in cross-section; Fig. 2 an end view showing the lock entered upon the thread of the bolt, and Fig. 3 a front view showing the shape of the lock as stamped from the sheet of steel.

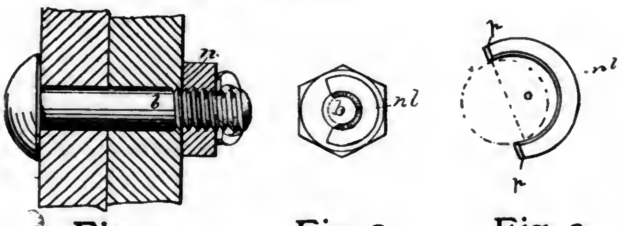


Fig. 1. Fig. 2. Fig. 3.

MILLER'S NUT-LOCK.

In detail, *nl* is the lock-piece, and is made from a piece of sheet steel, one arm a little longer than the other, the opening O, being cut in horseshoe shape, so that the points *p*, are drawn in slightly toward each other. *b* is the bolt, and *n* is the nut. When the nut has been screwed up as tight as desired, the lock-piece is driven down in front of the nut astride the bolt in such a manner that one arm of the lock-piece presses closely against the turning-off side of the nut, and in a manner wedges it down, while the other arm of the lock-piece is at the distance of one thread's width from the other side of the nut. The wedged arm prevents the nut from turning off or getting loose, while the other arm of the lock-piece, being free from contact with the nut, is not liable to be carried round on the thread by any movement of the nut.

The nut and lock-piece are shown in proper relative position in Fig. 2. The longer arm of the lock-piece is the one which should bear against the nut, as it gives a longer bearing in the thread of the bolt. It will be found that when the points of the lock-piece pass the center of the bolt they will spring toward each other, thus holding the lock-piece firmly in place.

The device is claimed to be simple, reliable and inexpensive. It is now controlled by the inventor and Glenwood Preble, of Indianapolis, to whom one-half the patent rights has been assigned.

Raper's Draw-Bar and Coupling.

WILLIAM RAPER, of Windsor, Ont., Canada, has recently invented an improved draw-bar and car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a perspective view of the

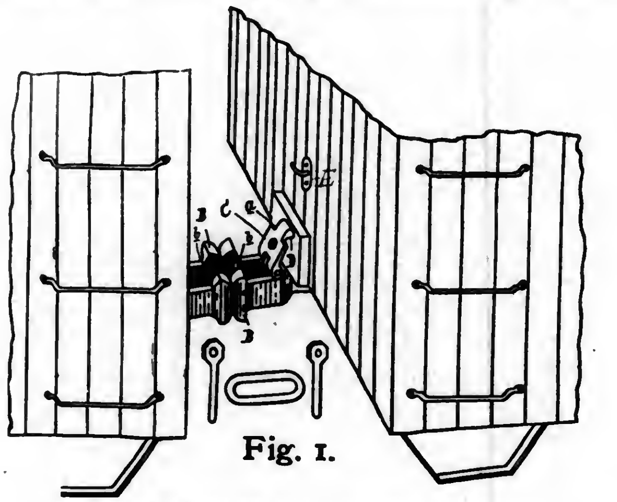


Fig. 1.

RAPER'S DRAW-BAR AND COUPLING.

improved car-coupling attached to two freight-cars ready to be coupled together; Fig. 2 a vertical central section through the car-coupling, one draw-head having its hinged cover opened and the coupling-pin removed; Fig. 3 a side view of one draw-head, and Fig. 4 a plan thereof.

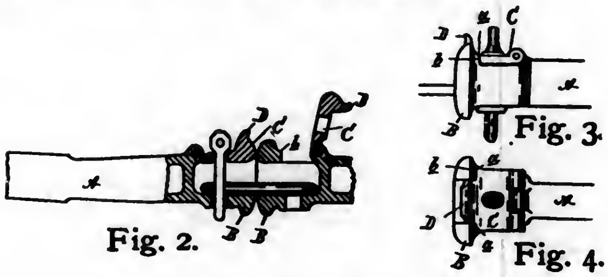


Fig. 2. Fig. 3. Fig. 4.

RAPER'S DRAW-BAR AND COUPLING.

A is the draw-bar of an ordinary link-and-pin coupler, provided with a draw-head B, of the ordinary construction, except that its top side C, does not form an integral part of the draw-head, but forms a separate piece, which is hinged at its rear end to the body of the draw-head so as to form a hinged lid thereto, which, when opened, gives

free access to the recess in the draw-head. The hinged top C, has formed on it near its free end the shoulders or offsets *a*, which, when the top is closed, impinge against the solid portions *b* of the draw-head. D is a lip formed near the free end of the hinged top. It forms a convenient handle with which the operator may open the hinged top. E is a hook attached to the face of the car in which the link is to be hung when not coupled.

In practice the operation of coupling cars with this coupling may be proceeded with in the same manner as with the common link-and-pin coupling in ordinary use; but it may also be performed in a manner entirely different which excludes all liability of accidents and saves time.

It is well known that in making up a freight-train composed of cars provided with the ordinary link-and-pin coupling the cars have to be assembled and coupled one by one, by the use of an engine, and no coupling can be made between stationary cars. With this coupler a coupling can be effected between stationary cars without the use of an engine.

To make up a train where the cars are provided with this device, the pins and links are first removed from the the draw-heads, then the cars are assembled or backed up against each other. The further use of the engine is now dispensed with, and for greater safety it may be moved some distance away. While the cars are now in this stationary position with the draw-heads impinging against each other, the brakeman enters between the cars, opens the lids of the draw-heads, drops a link in the recesses of the two draw-heads, closes the lid again and inserts the pins. Thus all the cars are coupled together, and the time required is greatly less than with the ordinary coupler, while the danger is entirely removed. This mode of coupling can even be performed where but one of the two draw-heads has the removable lid, as the link can be easily inserted endwise into the other draw-head.

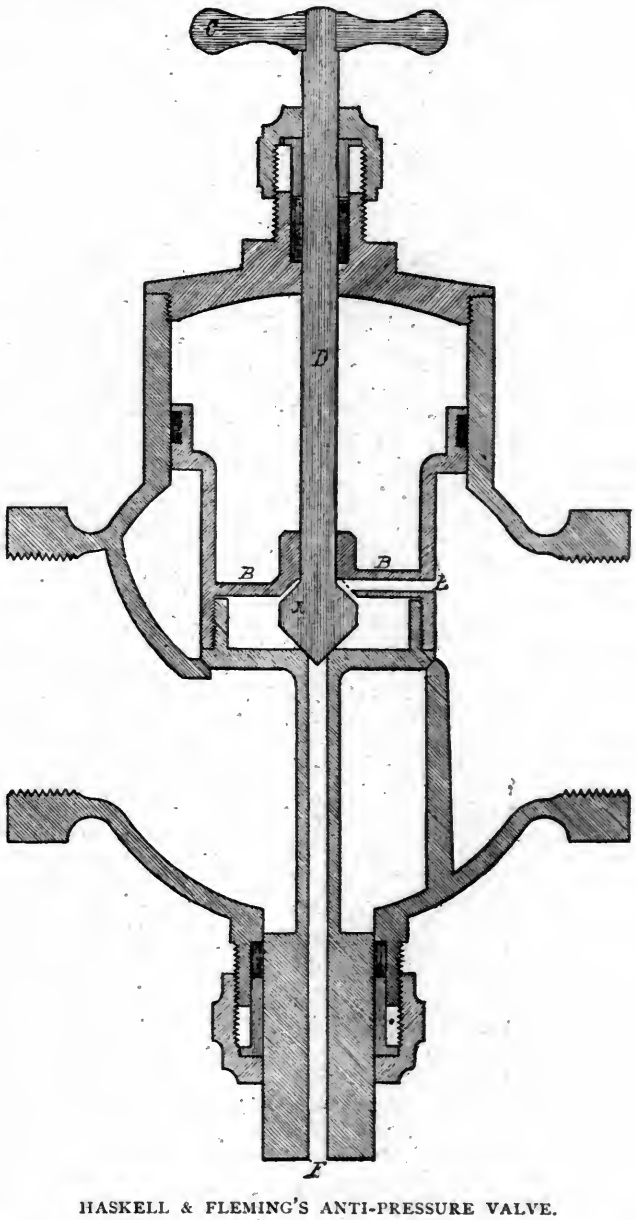
It will be seen that the strain in hauling does not come upon the hinge, but is taken up by the offsets or shoulders *a*, and the lid when closed is firmly seated against any other displacement, except in the direction in which it opens, and which is resisted by its own weight and the weight of the pin.

Haskell & Fleming's Anti-Pressure Valve.

CHARLES S. HASKELL and WILLIAM B. FLEMING, of Philadelphia, Pa., are the inventors of an improved anti-pressure steam and water valve, the construction and operation of which are shown in the accompanying cut, which represents a sectional view of the valve.

C is the handle, and D the stem, B B the main valve, and A A the secondary valve. To close the valve the handle C, is pressed down, thus closing the secondary valve and gradually bringing the full pressure to bear upon the upper side of the main valve as it closes. To open the valve the handle C, is raised, opening the secondary valve and gradually taking the pressure from the top of the main valve until the friction only remains to be overcome.

The operation of the device is as follows: In the position shown, the pressure entering by the pipe P, passes through the passage E, past the auxiliary valve; thence through the passage into the chamber above the main valve, thereby seating the main valve firmly and closing the same. If the handle C, be raised, the opening, E will be closed and the opening F will be opened. Therefore the water above the main valve will flow downward and escape through the opening F, and the pressure acting beneath the main valve and in the annular space around will raise the same in the chamber above it. It will be observed that the upper part of the main valve is larger than the seating portion below. It is obvious that the valve should be suitably packed and provided with suitable seats, as is shown in the accompanying cut.



HASKELL & FLEMING'S ANTI-PRESSURE VALVE.

The inventors have also designed an attachment to the device, by which it can be operated entirely by electricity, thus enabling it to be controlled from a distance. By this attachment the device can be made to serve a number of useful purposes.

It is claimed for the device that it operates with the pressure and not against it; that it is perfectly balanced, because the pressure is removed and gradually equalized in its first movement, by means of a small secondary valve inside and forming part of the main valve; that it is an

absolute cut-off, since, in closing the pressure is brought gradually upon the top of the valve until the full steam or water-pressure is exerted to keep it closed, and that it can be operated by a child, even the largest sizes, without the intervention of machinery.

Dougherty & Bryant's Metallic Cross-Tie for Elevated and Surface Railways.

EDWARD D. DOUGHERTY and GEORGE B. BRYANT, of Philadelphia, Pa., are the inventors of a metallic cross-tie for elevated and surface railways, which is herewith illustrated and described. The object of the inventors is to provide means for conveying the water, oil, and dirt falling on the ties into suitable conduits located alongside of the track, and also to provide yielding ties, whereby the noise occasioned by passing trains is considerably deadened, and the wear of the rails and car-wheels lessened.

In the accompanying cuts, Fig. 1 is a view in perspective of the cross-tie and box; Fig. 2 a longitudinal sectional view of the same, and Fig. 3 a transverse sectional view.

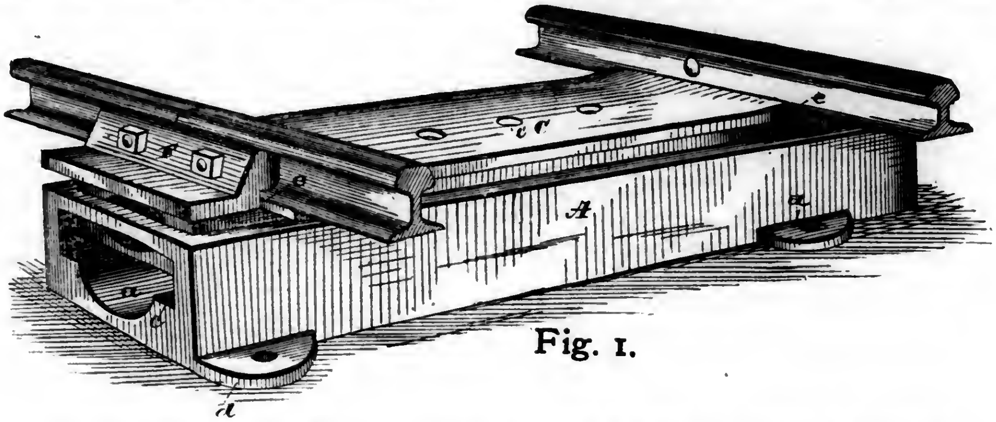


Fig. 1.

DOUGHERTY & BRYANT'S METALLIC CROSS-TIE FOR ELEVATED AND SURFACE RAILWAYS.

A represents a rectangular box open at opposite ends and provided with the longitudinal groove or gutter *a*, which latter is preferably semi-circular. This box is made of cast metal, and the opposite sides are connected together at their upper ends by the ribs or braces *b*. The bottom of the box is provided with the lugs *c*, which latter are arranged to prevent the lateral displacement of the semi-elliptic springs B, on which the cross-tie C, rests. The springs are slightly shorter than the width of the box to enable them to expand freely, and when in position in the box rest under the rails, so as to take the entire weight of the passing train. The groove or gutter in the bottom of the box is under the springs, and hence the latter do not obstruct the gutter.

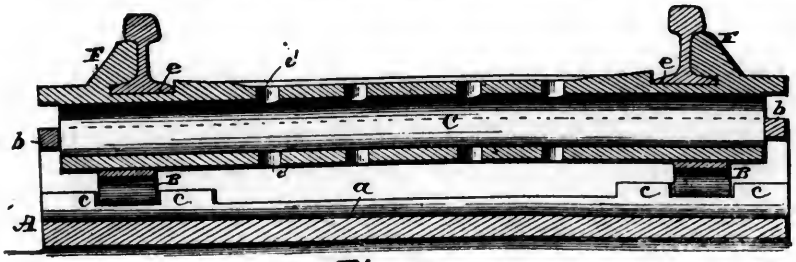


Fig. 2.

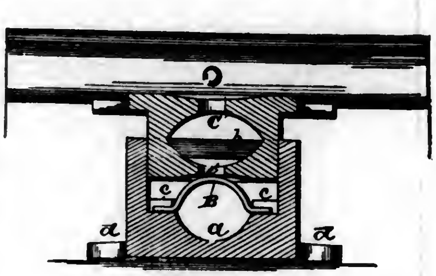


Fig. 3.

DOUGHERTY & BRYANT'S METALLIC CROSS-TIE FOR ELEVATED AND SURFACE RAILWAYS.

The boxes A, when employed on surface roads are embedded in the earth, while on elevated roads they are secured to the girders by means of the laterally-projecting lugs *d*, cast integral with the boxes. The cross-ties C, are also preferably made of cast metal, and are hollow and provided on their upper surfaces with transverse grooves *e*, in which the rails rest, and with the upwardly-projecting flanges F, which conform to the web of the rails and serve as fish-plates. The ties are adapted to rest on the semi-elliptic springs B, and move vertically within the box, and the upper surface thereof between the grooves for the rails are concaved so as to direct the water and oil falling thereon toward the longitudinal center of the ties, from which it passess through the perforations *e'*, in the upper and lower faces of the ties into the grooves in the box A. These grooves can incline slightly toward one side, so as to convey the water into a spout or conduit located alongside of the track. The ties C, are placed in position on the springs, (which instead of being semi-elliptic, can be of any other shape, and instead of being of metal can be made of rubber), and hence it will be seen that as a train passes over the same, the tie yields to the weight thereof, and consequently the noise produced by a train passing over a solid, unyielding structure is obviated. Again, by causing the tie to yield, the sudden shocks and jars occasioned by a heavy weight passing over a solid foundation is overcome, and the cars pass over the yielding ties with an easy motion. If, from any cause, the springs should break, the ties drop on the lugs *c*, which are cast on the bottom of the box A, and are held securely in position. By simply elevating the tie with a bar or lever, the spring can be replaced without stopping travel and without removing any of the parts.

It is claimed by the inventors that the use of this device avoids injury to the rolling-stock, does away with the use of fish-plates, saves time and labor in taking up and adjusting defective spikes, prevents spreading of rails, and effects a saving in time. The device is also claimed to be both economical and durable.

Wells' Oiler.

EDGAR J. WELLS, of Ticonderoga, N. Y., is the inventor of an oiler for mechanical uses, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a vertical sectional view of an oiler embodying the invention, and Fig. 2 a side elevation of the same.

A represents a cup or reservoir for the oil, which is provided at its lower end with a threaded projection *a*, to adapt the cup to be secured to a steam-cylinder, steam-chest, or any other mechanism to be lubricated. B is the oil-feeder, which has its lower end tapered and ground into an opening made to receive it in the lower end of the oil-cup. This oil-feeder has a vertical extending

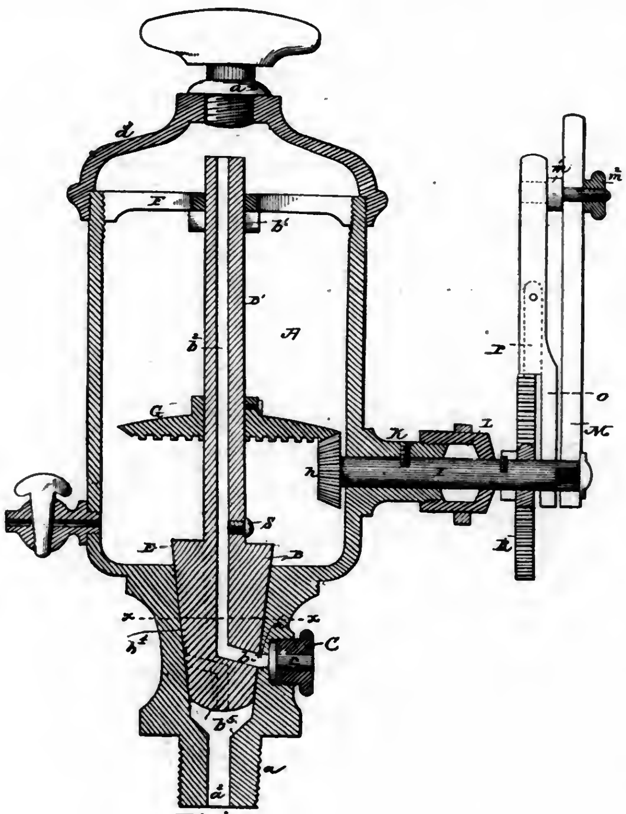


Fig. 1.

WELLS' OILER.

hollow shaft B′, the upper end of which bears in a spider F, that is screwed into the upper side of the oil-cup. A collar b', is made near the upper end of the shaft B′, and bears under the spider F. The central opening b^2, which extends down through the shaft b, connects with an oblique opening b^3, which extends out to one side of the oil-feeder, near the lower end thereof, and communicates with an opening a', which is made in one side of the oil-cup, near its lower end. C is a bushing which is screwed into an opening formed in the oil-cup, and this bushing is provided with a central opening c, which communicates with the opening a'. a^2 is the central opening, which is made in the lower end of the oil-cup and communicates with an opening b^5. S is a screw which passes through an opening that communicates with the central opening b^2, in the shaft B′, near the lower end thereof. b^5 is an opening which extends from the lower side of the center of the oil-feeder B, up to the side thereof, on a horizontal line with and nearly opposite to the lower end of the opening b^3, so that when the oil-feeder revolves, the openings b^3 and b^5 will alternately communicate with the opening a'. The upper end of the oil-cup is provided with a cover a^3, which is screwed on the upper side of the oil-cup, and is provided at its center with a screw-plug a^4, by means of which the oil is introduced into the oil-cup.

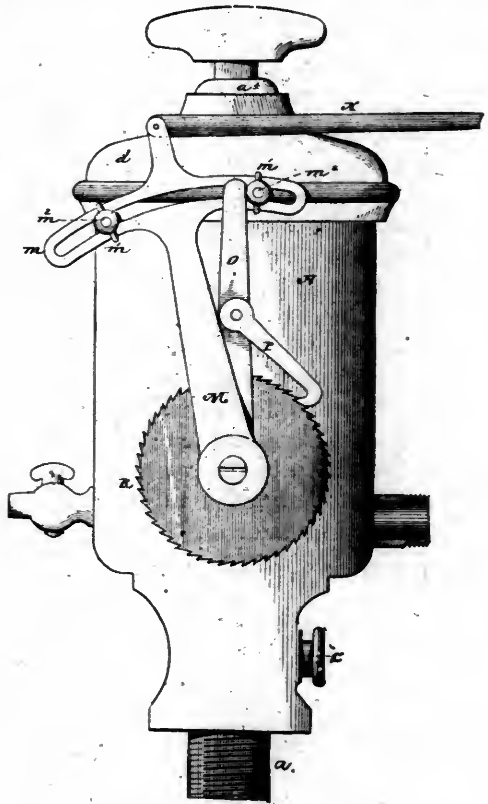


Fig. 2.

WELLS' OILER.

G is a bevel gear-wheel which is fixed to the shaft B′, at a suitable distance from the lower end thereof, and with this gear-wheel G, meshes a bevel-pinion h, which is attached to the inner end of a horizontal shaft I, that extends out through a bearing-sleeve K, that is formed in one side of the oil-cup. L is the packing-box, which is screwed on the outer end of the sleeve K, to prevent leakage of oil or steam around the shaft I.

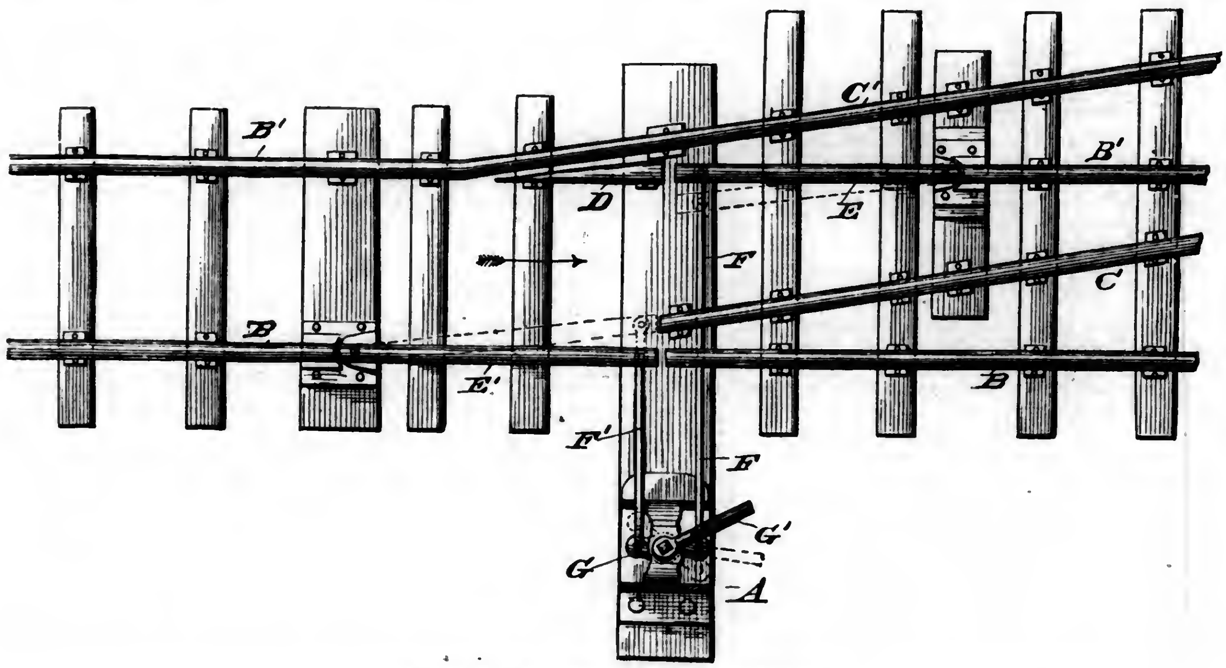
To the outer end of the shaft I, is loosely fixed an arm M, the upper end of which is connected by a rod N, to a valve-stem or other suitable part of the mechanism to which the oiler is attached. The arm M, is provided near its upper end with a slotted quadrant m.

O is an arm which is loosely secured to the shaft I, adjacent to the arm M, and to this arm O, is pivoted a pawl P, that is adapted to engage a ratchet-wheel R, that is fixed to the shaft I. The upper end of the arm O, bears against the inner face of the quadrant m, and this quadrant is provided with blocks m', which are secured by means of thumb-screws m^2, by which means the blocks m', may be moved nearer together or farther apart, so as to regulate the throw of the arm O, and thereby regulate the quanity of oil that is fed from the oil-cup. By means of this construction it will be readily understood that as the rod N, reciprocates, a rotary motion is imparted to the oil-feeder.

When the oiler is to be used on a locomotive, connection must be made with the pipes running from the cup to the nipple on the oiler. This connection being made,

the steam let on to the cup through the pipes will condense and the pressure will cause the water to float the oil to the top of the cup, and thence down through the opening b^2, and as the opening b^3, registers with the opening c, the opening c, is filled with oil. When the opening b^5, communicates with the opening c, as the oil-feeder rotates, the oil in the opening c, passes down through the opening b^5, and is then fed to the cylinder or steam-chest. When the engine is not in motion, no oil can be wasted. It will readily be seen that this oiler will oil a locomotive-cylinder, both when using and when not using steam.

When the oiler is to be used for machinery not provided with steam, the screw S, will be removed from the opening in the shaft b, and the oil will then be fed from the bottom of the cup instead of from the top. In order to enable the engineer to ascertain to a certainty that the oil-cup is performing its functions, the bushing C, will be made of glass or provided with an opening covered with glass. It will be seen that the operating parts of the oiler are all located in the cup, and are thereby protected from the wear incidental to the accumulation of dirt or grit. This oiler can also be applied to the driving crank-pins and eccentrics of a locomotive.



PURVIANCE'S AUTOMATIC RAILWAY SWITCH.

Purviance's Automatic Railway Switch.

BENJAMIN F. PURVIANCE, of Keokuk, Iowa, is the inventor of an automatic railway switch, which is herewith illustrated and described. The accompanying cut is a top plan view of the switch.

A represents the switch-stand, and B B′ the stationary rails of the main line, the rail B′, of the same being bent or curved outward at a point a little in advance of the switch-stand, where it connects with the outer rail C′, of the side track. At the point where the main rail B′, is thus curved outward, is placed a frog D, of ordinary construction, this frog being secured in such a position, as shown, that when a train is passing over the main line the wheels on that side of the line will pass from the main line over the frog and thence upon the main line again when the short movable rails are in the position shown. E E′ indicate the short movable rails which form a part of the main-line rails B and B′, and are arranged diagonally opposite each other as shown, the free ends of these movable short rails being connected by the draw-bars F F′, to the two ends of the bell-crank G, secured upon the switch-stand A, and provided with the operating-handle G′.

When the bell-crank is turned by the operating-handle of the same into the position shown in dotted lines, it will operate to move the short movable rails in reverse directions, the left-hand movable rail E′, being thrown in line with the inner rail of the side track, thereby enabling a train approaching in the direction of the arrow to run upon the side track, or a train from the side track to run out upon the main line, the other short movable rail E, being swung inward out of line of the frog D.

When a train approaches in either direction over the main line, and the switch is open, as shown in dotted lines, to put the side track in communication with the main line, the wheel-flanges will strike against one of the short movable rails (according to which direction the train is moving) and move the same in line with its main rail, the other movable rail being operated through the bell-crank and draw-bars by the movable rail to swing it automatically in line with its respective main-line track, the movable rails being of such short length that there will be no difficulty in their being operated by the locomotive.

When the movable rails are swung in line with the rails of the side track and it is desired to have the train pass from the main line off upon the side track, it is, of course, necessary for the switchman to retain hold of the operating-handle or lever G′, thereby holding the movable rails in this position, and preventing the wheels of the locomotive from automatically closing the side tracks by throwing the movable rails in line with the main rails, as before described.

It will be seen that it is impossible for the train to run off upon the side track (unless the switch is deliberately

held for that especial purpose) or into the open switch, as the train itself operates automatically to bring the movable rails in line with the main rails no matter from which direction the train may be approaching over the main-line tracks.

It is claimed for this device that it is peculiarly simple in construction, devoid of complicated mechanism, and not liable to breakage or derangement.

The device is now controlled by the inventor and C. Hills, of Keokuk, Iowa, to whom one-half the patent-rights has been assigned.

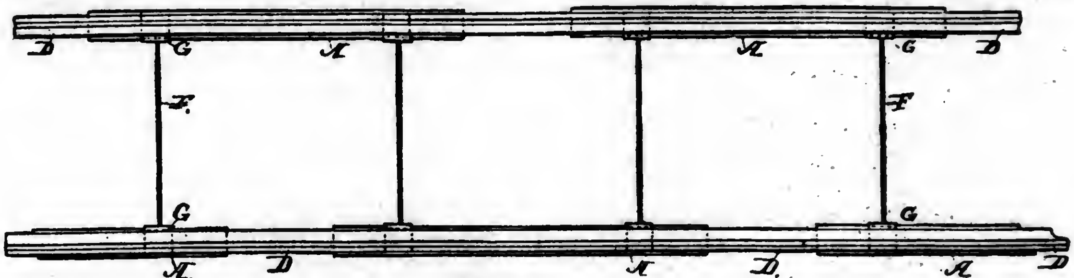


Fig. 1.

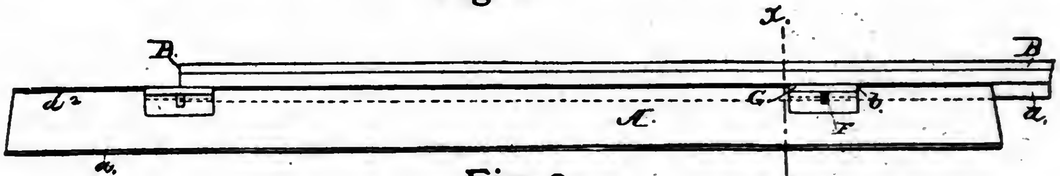


Fig. 2.

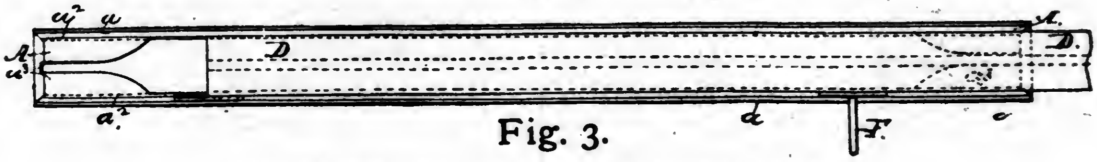


Fig. 3.

GIBBON'S IMPROVED CONSTRUCTION OF RAILWAY TRACKS.

Gibbon's Improved Construction of Railway Tracks.

THOMAS H. GIBBON, of Albany, N. Y., is the inventor of an improvement in the construction of railway tracks, which is herewith illustrated and described. The object of the invention is to provide suitable appliances for building steam or street-railway tracks in a permanent and substantial manner, to prevent the spreading and creeping of track, allowing the rails to expand and contract, and to dispense with the use of wooden ties, longitudinal stringers, nails, bolts, and spikes; and it consists of a metallic tie and combination, a series of which form the bed for the rails, the metallic tie being arranged in the track so that the center of each tie will be immediately opposite the space between the ends of the two adjacent ties in the opposite track. A transverse tie-rod runs from each end of the tie, and each of these rods connects with the nearest end of the opposite located tie at right angles in such a manner that each tie will be connected with two adjacent ties of the opposite track. A transverse tie-rod is fixed at each end, so as to extend at right angles therefrom, and is secured to the opposite metallic tie at its nearest end. By this means the two tracks are connected together by a system of bracing, and when laid as above described the metallic tie is filled and surrounded with the ballast, and when running through cities the track is paved in the usual manner.

In the accompanying cuts, Fig. 1 is a plan view of a railway track embodying the invention; Fig. 2 an enlarged side elevation of the metallic sleeper and rail combination; Fig. 3 a plan view of the same; Fig. 4 a transverse section through the metallic tie and rail combination at the line x x of Fig. 2 on an enlarged scale; Fig. 5 an enlarged perspective end view of the metallic sleeper with the rail removed; Fig. 6 a perspective view of the transverse tie-rod; Fig. 7 a perspective view of the rail with the tongue mortised, and Fig. 8 a plan view of the plate with groove and shoulder.

A represents the metallic tie, which consists of an oblong metallic box opened at the top and bottom or perforated, its sides and ends inclined inwardly and upwardly so as to produce a large bearing-surface for its base.

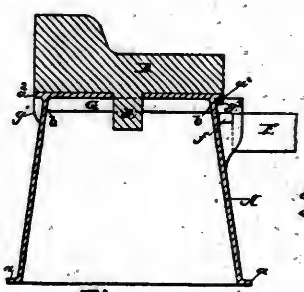


Fig. 4.

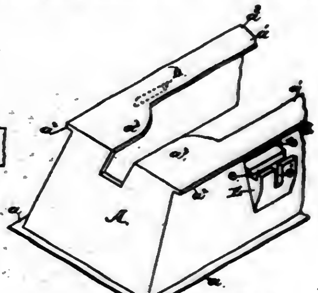


Fig. 5.

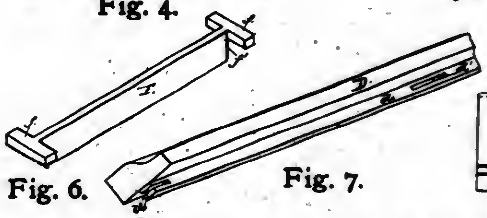


Fig. 6. Fig. 7.

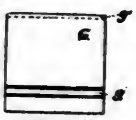


Fig. 8.

GIBBON'S IMPROVED CONSTRUCTION OF RAILWAY TRACKS.

Around the lower edge of the box, externally-projecting flanges a, may be formed, and also on the upper edge of the box are internally and externally projecting flanges a' and a^2, and at each end of it are internally-projecting flanges or guides a^3, formed on each side near each end of the box, as shown in Fig. 5. These flanges or guides

are adapted to receive the tongue *d*, which runs along the entire length of the rail D, thus affording greater strength and true alignment to the rail. The metallic box is provided with two mortises *b*, immediately under the flange *a'*, on each side, near the end, and directly in line with the center line of each mortise *b*. A lug E, with recesses *e* and *e'*, or its equivalent, may be formed to secure the head *f*, and shoulder *f'*, on each end of the transverse tie-rod F. A recess is formed at each end of the box to receive the tongue *d*, of the rail D. The rail D, is provided with a tongue *d*, which is fitted to lie between the flanges or guides a^3. This tongue is mortised, and located so that the mortises *d'*, in the tongue *d*, shall be in the line of the mortise *b*, as shown in Figs. 2 and 5, to receive a plate G, which passes through the mortises *b* and *d'*, thereby giving bearing for the rail and securing it to the tie. The plate G, which passes through the mortises *b* and *d'*, is fitted with a shoulder *g*, and a groove *g'*, to receive a wedge g^2, which absolutely locks the rails and metallic tie together, and thereby prevents the rails from becoming loose from lateral or vertical strains. The transverse tie-rods F, shown in Fig. 6, are provided at both ends with cross-heads *f*, which fit into the recesses of the lug E, in the metallic tie A, and these rods are arranged as shown in Fig. 1, so that the rods running from one end of the metallic tie will reach to the end recess of the nearest metallic tie under the opposite rail, and this arrangement of transverse tie-rods is maintained throughout the entire track. The metallic tie A, should be so arranged in the track that the distances between the mortises in two adjacent ties on the same rail will be spaced at the same distance apart, so that the middle of each tie will lie exactly opposite the space between the ends of the two adjacent ties of the opposite track, as shown in Fig. 1.

It is claimed for this system of construction that it insures the absence of all perishable material, like timber; the absence of all spikes and joint-plates, or bolts or nuts; the impossibility of low joints; the impossibility of the gauge of the track either narrowing or spreading, whether laid in unpaved, macadamized or paved roadways, and a vertical as well as lateral stiffness to the rail.

It is also claimed that this system combines rapidity and accuracy in construction, and permanency and solidity when laid; that the joints must be perfect; that the track must be rigid and smooth-running; that economy in maintenance of both equipment and track must result, and that it is of practical value to both live-stock and cars.

The improved construction as described is now controlled by the Metallic Street-Railway Supply Co., of Albany, N. Y.

Rhyn's Machine for Forming Car-Followers.

HENRY RHYN, of Cincinnati, O., has recently invented a machine for forming car-followers. Heretofore followers have been first formed with one device and then punched with another; thus in using two devices it requires two operations. With this machine the forming and punching is done in one operation, and is accomplished with only three parts, viz: an upper block, a lower block and a pin-punch.

In the accompanying cuts, Fig. 1 is a perspective view of the entire machine, and Fig. 2 a sectional view of the upper block A, lower block B, pin-punch C, and iron H. The form of the lower block B, and position of its hole *b*, is exactly the same as the form and the position of the hole in the required follower to be formed and punched. The hole *b*, is tapered, as shown in Fig. 2, to give ready passage for the punching *h*, through it.

The upper block A, has flanges *a' a'*, which serve as cutting-edges. The inner sides of these edges closely fit the lower block B, and a straight hole (not tapering) directly in line and above the hole *b*, in the block B. The pin-punch C, is larger at the punching end *c*, so that when this large end is driven through the iron H, by blows of the steam-hammer, it will readily fall out of the iron and through the block B. The thickness of the blocks A and

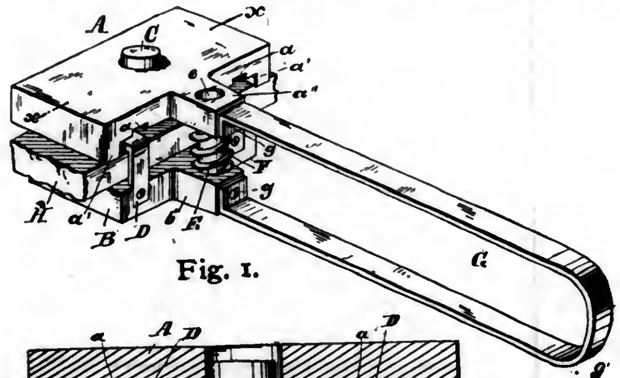


Fig. 1.

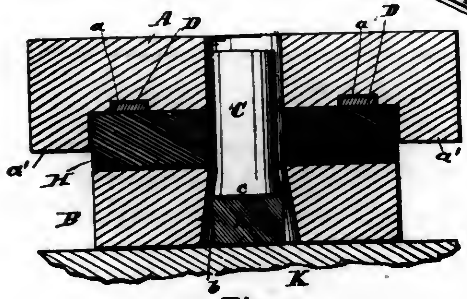


Fig. 2.

RHYN'S MACHINE FOR FORMING CAR-FOLLOWERS.

B, and the depth of the flanges *a' a'*, and also the length of the pin-punch C, depend upon the thickness of the follower to be forged. It will also be seen that if the blocks are made with the form corresponding to the shape of the required follower and the holes in the proper position, followers of any shape or form can be forged by the above arrangements.

After the iron is forged or hammered to its proper size, the block B, is placed upon the anvil K, of the steam-hammer, when the iron is laid upon this block and the block A, upon the iron H, in such a way that it will match the block B. Then the pin-punch C, is inserted into the hole of the block A, and by blows upon the top *x*, of the machine, a follower is formed and punched. In order to facilitate the handling of the blocks, so as to have them always ready for operation, a spring-handle G, is fixed to the projections *a''* and *b'*, with two set screws *g g*. This handle is bent at *g'*, as shown. To maintain the blocks in a true position to each other, a stud E, is fixed into the projection *b'*, of the block B, which stud extends into a hole in the projection *a''* of the block A. This stud serves also in holding a spiral spring F, in position.

As the flanges of the upper block press against the ends of the follower in the operation, two-straps D D, are placed over the iron H, and the ends of these straps are fastened to the sides of the block B, when the spring F,

releases the flanges of the upper block from the follower. To prevent injury to the straps, grooves *a a*, are pressed in the under face of the upper block, by which means all the extra force of the blows of the hammer is brought upon the whole face of the follower. The edges of the flanges *a' a'*, of the block A, and the straps D D, are of a proper and even distance from the upper face of the block B, so that the iron will pass through freely.

After the iron is forged to its proper size it is inserted between the blocks, and the pin-punch placed in the hole of the upper block, as shown in Fig. 1, and by one or more blows of the hammer on the top *x*, of the machine, the flanges and pin-punch are driven through the iron, as is seen in Fig. 2, when the machine is partially taken off the anvil K, so as to allow the punchings *h*, and pin-punch C, to fall out, and, by inserting the iron for the next operation, the finished follower in the machine is easily removed.

The inventor prefers to use the pin-punch C, independent and disconnected from the blocks A and B, instead of having it screwed or fastened in any way to the block A, as the pin-punch being larger at its end *c*, will be free from any pressure from the follower and the follower is correspondingly easier released from the block A, having the flanges.

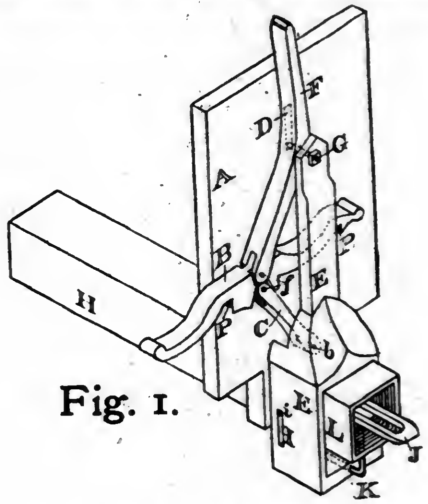
The object in view in constructing a machine of this kind is to form and punch articles with the power of the steam-hammer, and it differs from a common drop-press or press-punch as it is independent and disconnected from any power in its upward movement. It is especially adapted in transforming old car-axles into new car-followers, the advantages being from 400 to 1,000 per cent., varying according to the strength and skill of the hammer-smith. As the iron is best formed at a red heat it is put through the machine immediately after it is forged to its proper size.

Cannan's Car-Coupling.

MATTHEW C. CANNAN, deceased, of Ulster, Pa., was the inventor of a car-coupling, letters-patent upon which have been granted to his administrator, Jesse R. Coolbaugh, of Wysox, Pa. The construction and operation of the device are shown in the accompanying cuts. Fig. 1 is a perspective view of the draw-bar and coupling devices; Fig. 2 a vertical longitudinal section, and Fig. 3 a horizontal section.

A represents the end of the car, and F B C the levers for coupling and uncoupling from the sides or top of the car. F is an elbow-lever pivoted at its elbow to an extension of the sliding box E, by a bolt G, which slides in the slot D, in the end of the car. The lower end of the lever F, is pivoted to the cross-lever B, which extends to either side of the car. The toggle-lever C, is pivoted to the cross-lever by the bolt *f*, and its lower end is pivoted upon the end of the car by the bolt *b*. E represents a sliding box, which carries the coupling-pin K, upward through the link J, to couple the cars and downward to uncouple, and is operated by the levers F B C.

L represents a metal draw-bar in one piece, having a square opening *n n*, to receive the link-follower U U, with its spiral spring V, which operates it. The opening also receives the link J, with its collar O. The draw-bar has a flaring mouth sufficient to receive links from cars of different heights and widths, and also has an opening in the opposite end for a bolt M, to screw in; also, a round opening *l*, extending from the end of the bolt M, to the square opening *n*, for the link-follower U, to operate in. J is a coupling-link with a wedge-shaped rear end resting in the socket of the link-follower U, as shown in Figs. 2 and 3, the sides of the link tapering each way from the link-collar O, and the corners being slightly rounded at each



CANNAN'S CAR-COUPLING.

end. K represents an angular coupling-pin attached horizontally movable to the bottom of the sliding box E, and then passing vertically up through the draw-bar L, and it may be made of solid round metal bent at a right angle, or of bars simply joined together at the angle, which will facilitate the removal and replacing of pins in case of breakage.

H represents the elongated box in which the draw-bar L, plays back and forth, being acted upon by a spiral spring T, placed between washers N N, these washers sliding in rabbets *t t* in the rear end of the box H. The bottom of the car, together with timbers and iron plates that are used around many of the draw-bars in present use, may take the place of the box H.

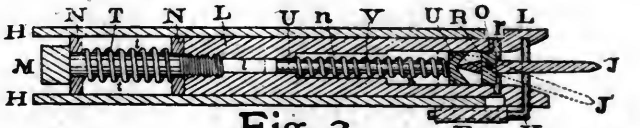


Fig. 2.

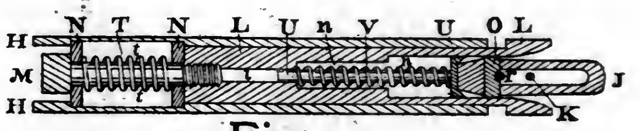


Fig. 3.

CANNAN'S CAR-COUPLING.

N N are square-cornered washers operating in rabbets *t t*. T is a spiral spring between the washers N N, in the rabbets *t t*, and is for the purpose of buffer and draw-spring, by means of the bolt M, passing through the washer N, the spiral spring T, and other washer N, and then screwing into the rear end of the draw-bar L. M is a bolt that screws into the rear end of the draw-bar L, and takes the draft-strain. U U represent a link-follower with square-shaped outer end, having therein an oblong socket, in which rests the inner end of the link J. V is a spiral-

spring acting upon the link-follower for the purpose of keeping the link J, at all times in place to enter of itself and without assistance the mouth of the draw-bar L, on the opposite car. O is a square-cornered collar around the link J, near its inner end, and can be made of half-round iron or any metal of similar shape best adapted for the use it serves, the flat side being toward the link.

R is a pin running laterally through the collar O, and the link J, the link being suspended thereon, and it is by means of the link-follower U U, the collar O, and the pin R, acted upon by the spiral spring V, that the link is kept in a horizontal position for use; and by means of a socket in the outer end of the link-follower and the flaring mouth of the draw-bar that the end of the link is movable up or down to one side or the other, as is necessary in coupling cars of unequal heights and widths; and the link J, may take the position of J′, when attached to a similar draw-head on a lower car; and as each and every draw-head has its own link the above arrangement allows the link to pass over or under the opposite link, when one or both links may be coupled by the pin or bar K, in the opposite draw-head, thereby making a double or single link-coupling, as necessity may require. *r* is a pin passing through the top of the draw-head L, thence through the opening in the link J, close in front of the collar O, and then into the bottom of the draw-head L. It is the inner bearing-bolt of the link J, and aids in keeping this link suspended in place for use, as may be seen in Fig. 2, and is only moved in case of removing and replacing the link for repairs.

P P are stationary pins in the end of a box-car, upon which the lever B, rests and operates horizontally across the end of car; and B is the lever by which the operator raises or lowers the coupling-pin when standing at either side of the car. The coupling is done from the top of the car by lifting and at the same time throwing the lever F, over to the right, and uncoupling by throwing in the opposite direction. The lever B, has three shoulders or offsets on the bottom, and, as shown in Fig. 1, two of these rest against the pins P P, and these pins hold the levers when the pin K′ is dropped down to its proper place when uncoupled, and the other shoulder rests against the pin P at the right, and this pin keeps it there when the coupling-pin K, is raised to place in coupling by levers being thrown to that side; and in case it is found that this pin P, at the right is not sufficient at all times to hold the levers in place when the cars are coupled, spirals or any springs answering a like purpose may be placed under the top of the opening of the sliding box E, and directly over the draw-bar L, which will not only serve as a lock in keeping the sliding box E, up when coupled, but would assist in raising the same when operated. The levers F B C, are more especially calculated for freight-cars, yet may be used on many others, and on some cars—such as flats—where the levers F B C, and the extension on the sliding box E, are in the way, the box may be moved up and down by simply running levers from each side of the car, attaching them to the sliding box E, and pinning them to the car at a proper leverage distance from the box E, thereby doing away with the levers F B C, and the extension on the sliding box E.

This device is claimed to be simple in construction, easy of adjustment, and not liable to derangement. It is also claimed to be inexpensive and durable.

SOME months ago the JOURNAL made mention of a practical improvement in suspension-bridges, by Mr. Thomas M. Griffith. The inventor has since perfected a model some eight feet in length, in which the improvements are fully shown. This model was to have been sent to the Exposition at New Orleans, but it was not completed before the first of February and then it was decided not to send it there, and, therefore, up to the present time it has served only as a parlor ornament in the house of the builder. It is soon, however, to be placed upon exhibition. The few persons who have seen this model say that in addition to its representing, as it does, some great improvements in suspension-bridge construction, it is a very creditable piece of workmanship.

THE manufacture of steel railway sleepers is extending in England.

GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer, or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

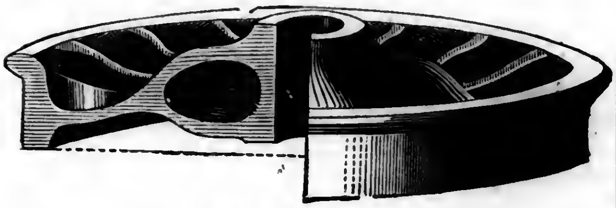
The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, Presiden

Ramapo Wheel and Foundry Company.



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W. W. SNOW, Superintendent and General Manager.

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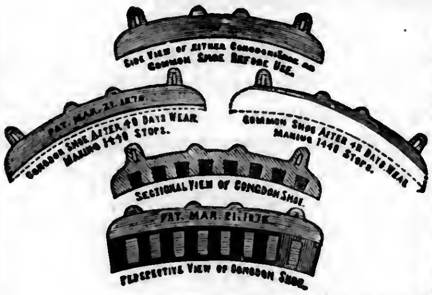

This improvement consists of a brake-shoe having imbedded in its body of cast iron, pieces of wrought iron, steel, malleable iron, or other suitable metal, and while being more effective, in that greater uniformity of friction is obtained when applied, exceeds in life, or the duration of the shoe itself, that of the cast-iron shoe by over *seventy-five* per cent. Its extensive use on many of the most prominent roads in the country has proven its economy and superiority over any other shoe in use. All communications should be addressed to

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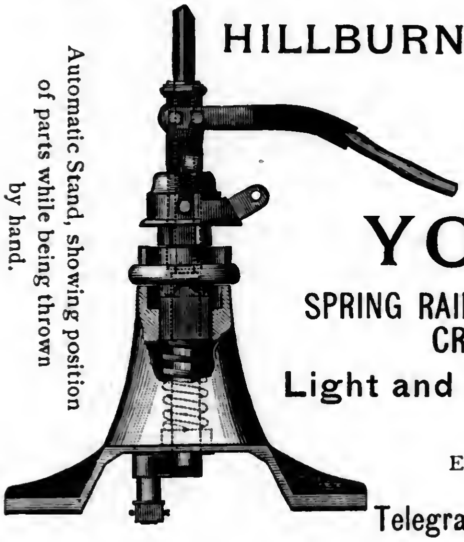

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Five through trains daily between New-York City and all points on the Housatonic Railroad, from the Grand Central Depot via New-York, New-Haven and Hartford Railroad, at 8 A. M. (Passenger), and 9 A. M. (Mixed); 3.40 P. M. (Limited Express with through drawing-room cars), 3.40 P. M. (Passenger), and 4 P. M. (Mixed). Sunday Passenger-train leaves New-York at 6 A. M.

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H. D. AVERILL, Gen'l Ticket Agent.
W. H. YEOMANS, Superintendent.

General Offices, Bridgeport, Conn., July 13th, 1885.

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American Railroad Journal.

WHOLE NO. 2,568.] NEW YORK, SEPTEMBER, 1885. [VOLUME LIX.—No. 6.

ACCIDENTS FROM BROKEN RAILS AND WHEELS.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHEN a rail breaks the results are usually of a serious nature, and as derailments from this cause are on the increase, it should receive attention from railway officials. Not that it is possible to procure rails that will never break, but it is believed that greater care in their selection and better treatment while in service will reduce breakages to a notable degree. But it is an error to suppose that to increase the weight of rails adds to their strength, unless due regard is paid to the quality of the material and the manner in which it is distributed, *i. e.*, the rail-section. Roads that have recently undergone renewals of rails of greater weight than those that were removed are regarded as safer from breakages of rails than before the change; but this is only true when conditions other than the weight of rails have been considered. If there is no greater tie-support and the traffic has increased and heavier rolling-stock is used, breakages will continue to be as frequent as before the changes.

Some who have sought to improve the quality of rails have hardened them to resist the rolling friction to which they were subjected. In doing this they have reduced their vertical and lateral strength so that while they have been improved in the direction of *wear*, their *strength* has been impaired and breakages increase; and an 80-lb. rail of inferior goods is not as safe as a much lighter one of good material, and is fashioned with a view to strength rather than wearing qualities. But engineers will continue to purchase and use heavy rails that will carry millions of tons without wearing out, *if they do not break*, and some prominent men of that profession propose, as a measure of economy, to increase the weight of rails and reduce the tie-support. They argue that with the present low price of steel and the high price and growing scarcity of ties, the weight of rails and the distance between ties may be increased almost indefinitely. In the distant future, when ties are very, very scarce, and we can afford an abundance of very good frost-proof ballast and steel ties, we may place them very far apart and surmount them with very heavy and safe rails; but for the present, with a liberal supply of good wood ties and a fair supply of gravel or rock-ballast and an honest rail of moderate weight and properly cared for, we can make an accident from a broken rail a rare occurence.

The question is often asked: "Why do rails break?" and the usual explanation follows that there is now and then a bad rail in any good lot, which is all very true; but most good rails do not break from an inherent weakness in them, but from ill treatment. A rail of rather inferior quality may, if well cared for, serve a long time—wear out in fact—without breaking; but it must be uniformly supported at all times, for even a good rail will soon break if the deflection is uneven, and it should be the aim of all who are in charge of laying or repairing track to make the rail-support uniform throughout its entire length. This is easily done by spacing the ties properly and giving careful attention to joint-fastenings. Many rails break at or near the ends of the fish-bars by being gripped too tightly and not lying properly on the ties, so that the combined support of the ties at or near the joint, and the joint-fastening, will not admit of as much depression at that point as in other parts of the rail, and it operates as a fulcrum and point of fracture. Thorough drainage will prevent rails from breaking to a great degree, especially in severe cold, by preventing the action of frost, or heaving of the ballast or road-bed.

Attention to the foregoing precautions will reduce the number of broken rails, and a more efficient rail-fastening will, in many cases, prevent derailment from broken rails. Trains frequently pass over broken rails without damage or derailment, but with a better system of fastening, the broken rails would not be thrown out of place and there would be no damage other than the loss of the rail.

Trackmen who have the care of heavy rails are liable to place too much confidence in their strength and safety, and do not give proper attention to what they consider minor details of repairs, and breaks occur when least expected. The best rails need close watching and good treatment to insure safety, and these facts should never be lost sight of by railway managers or employés.

Wheels, like rails, do not always break because they are of poor quality, but good wheels frequently fail from rough usage; and the first move that is suggested to prevent breakage of wheels is greater care in their selection, and the first move of all is to select the makers, for, be it known, some establishments make a specialty of turning out wheels of such inferior quality that some roads have rejected them and will not even accept them as repairs from foreign roads.

As there is no remedy for the frequent breakage of poor wheels—or rather cheap wheels—but to discard them entirely, no suggestions need be offered here other than to point out some of the causes of breakage of good wheels. Frogs and guard-rails may be charged with more broken wheels than anything else with which they come in contact. Well-made frogs when properly placed and kept in good repair are not particularly destructive to wheels, but some trackmen have very queer notions about laying frogs, and wheels suffer in consequence. Some lay the frog wide-gauge at the point, for reasons that they cannot explain, while others contract the gauge at the point for some mysterious purpose not yet made public. These mischievous practices bring the wheel-flanges in contact with either the wing or throat of the frog on one

side, or the guard-rail opposite, with powerful shocks that are liable to break a wheel at any time, but are sure to loosen the frog and guard-rail, and it is only a question of time before this nonsensical practice will cause a general wreck at any given point. When it is noticed that a wing, point or throat of a frog or a guard-rail is being hacked and gouged by wheel-flanges the cause should be sought and the remedy applied at once; and investigation will show that the track is too wide or too narrow, or that the guard-rail is not the right distance from the gauge-line or point measured from as the gauge side of the track, or that the point of the frog is not the right distance from the head of the switch. Every one of these defects is destructive to wheels, and a frog that is loose or pounded badly, or a loose guard-rail, are elements of danger that should receive immediate attention. Some of these defects are destructive to flanges while others chip the tread, and however slightly the wheel may be injured of itself it may cause a serious disaster, and the old adage of "a stitch in time" should be kept in mind and applied to frogs as to all other track repairs.

It frequently happens that trucks are out of square and wheel-flanges on such trucks will cut frogs, etc., as mentioned above. This is no evidence of defect in track or fixtures and when it is the exception, rather than the rule, no notice need be taken of it by trackmen except to call the attention of trainmen to it when the truck may be traced out and repaired. And here it may be said that "trucks out of square" is by far a too frequent cause of broken wheels and derailment without broken wheels.

Another cause of breakage of wheels is ver open joints in the rails. This can be remedied by means well-known to trackmen. At switches a certain amount of space is necessary (an inch is sufficient, but frequently several inches of space may be found at switches) for the free movement of the switch rails, but no unnecessary space should be allowed between rails as it is destructive to both wheels and rails.

Crossings are also destructive to wheels, but as there is as yet no satisfactory remedy known for this evil no further mention will be made of it here. It is a waste of time to call the attention of the readers of the JOURNAL to the causes of non-preventable accidents (or the non-preventable causes of them), and only such causes as may be successfully counteracted will receive attention.

As before remarked the first consideration is to procure good rails and wheels, but it is of prime importance that the apparently trifling details of repairs mentioned herein receive prompt attention at all times. The relations of rails to wheels are such that a proper treatment of the former has a beneficial effect on the latter, and managing officials will do well to bear in mind that it is close attention to details that renders perfection possible, and that many of the causes of accidents from broken rails and wheels are wholly inexcusable or entirely under their control, and that lack of attention to them is nothing short of criminal neglect. The published records of derailments for nine years from broken rails give the number as 529; and from broken wheels, 237. All of these derailments were serious in their effects and nearly all resulted from preventable causes that were within easy reach of officials and employés.

"TWO INTO ONE—NO TIMES."

BY EDGAR C. DAYTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

"Two into one—no times, with nothing over." It is difficult to get away from this bald fact, and it is equally difficult to get away from the fact that two railways cannot come into direct competition with profit where the amount of business is barely enough for one road. The two propositions are precisely similar, yet strange to say, shrewd financiers either cannot or will not see it.

The dreary history of our railways for the past three years shows that something is radically wrong. It is a continuous record of throat-cutting and insolvency. Each road is watching its rivals, anxious to prevent their reaping profits, and ready to plunge into direct competition at the slightest indication of another line operating to advantage. And this competion, which is called the life of trade, is death to railways.

The peculiar part of it all is that competition is entered into without, apparently, the slightest hope of financial profit. A road may be operating between two points and it may show earnings between these points. The amount of business may be fairly large, but not excessive, and profit results simply because the road has a practical monopoly between these points. The road can readily manage the entire traffic and can manage it at a fair profit; but the construction of a parallel road means simply starvation for both. Assuming that such a competing line is built, it naturally follows that each line gets a share of the traffic, and the rates are, of course, slaughtered in the hopes of getting the lion's share. The profits vanish. It is simply a case of "two into one—no times, with nothing over." And yet in the face of this inevitable result there is scarcely an instance where a road has been allowed to reap the advantages of a reasonable monopoly. A rival line is constructed in the full knowledge that it can only be operated at a loss, and there is a dog-in-the-mangerishness about this feature of railway competition that is truly painful.

It is not surprising that the form of competition known as "paralleling" has come to carry with it a grave significance in railway diction, and that our legislatures are directing their attention to its restriction. The difficulty is to restrict railway competition without fostering monopoly, and this is a difficuly with which legislators will have to struggle for years before they can successfully accomplish any results. For some reason or other there is a fascination in railway investment that to a great extent blinds the judgment of investors. Again, it is evident that railways offer one of the few forms of investment where large amounts of capital can at once be invested. Again, apparently, the impression obtains that it is a profitable form of investment. Such it may be under reasonable conditions of prosperity, but the history of railway investment for the past few years gives anything but a profitable showing.

About the best thing that could happen at present would be the growth of a general disbelief in the profit of railway investment. If our capitalists would only believe that there was no security in railway investment, that it was dangerously speculative, that they could invest their capital elsewhere to better advantage, and if they would only stick to this belief for half-a-dozen years, the railway

world would be the gainer. The only cure for the evils of over-production is a period of absolute cessation, and it would seem that there has been an over-production in railway construction. Railways are supposed to grow up to the towns. That is the true principle and the only one whose practice results in profit. Unfortunately, of late the towns are expected to grow up to the railways, and they have not grown fast enough. It is, perhaps, going pretty far to say that railway construction should cease entirely for five or six years, but if such an absolute cessation should take place there can be little doubt that the roads would be in better shape at the expiration of that time than they are now; and to avert the evils of ruinous competition brought about by reckless railway construction, the very simple suggestion is made to "quit it." We have pretty nearly reached hard pan now, and a little wisdom may be gained by reflecting upon that simple truth, "two into one—no times, with nothing over."

SOUTHERN RAILWAYS DURING THE REBELLION.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

DURING the late war of secession, the railways in most of the southern states occupied a secondary position owing to the wonderful water facilities afforded to the invading forces of the Union. The Mississippi river—that "inland sea" as Mr. Calhoun appropriately styled it—with its numerous tributaries, afforded safe and easy transit to the very heart of the Confederacy. Steam gunboats and transports rapidly conveyed large armies and their necessary supplies to most points of strategic importance. Gunboats in the York river guarded the right flank of McClellan, when marching up the peninsula, and by that stream all of his supplies were brought within a few miles of Richmond. All supplies required by Grant's army reached City Point by water, not an hour's ride from the beleaguered city of Petersburg. When reverses occurred the gunboats were arks of safety while pursued by a victorious enemy. Such they proved to be to the demoralized army of Grant, while cowering under the protection of their guns at Pittsburgh landing, and none the less so to the Army of the Potomac when forced to make the memorable "change of base" from the swamps of the Chickahominy to the banks of the James river.

Still, the railways were of great, and in some cases, of decisive importance to both the contending parties during the war. But for them, the first battle of Bull Run would have probably resulted in a victory for McDowell's troops. Without their aid his army would not have found Stonewall Jackson and his command opposed to it; nor would the first attacks of Grant's army in Petersburg have been unsuccessful, but for the arrival of trains—not an hour too soon—freighted with troops, hurriedly despatched from the distant coasts of Carolina and Georgia.

The most signal instance by far of the value of railways to an invading army is afforded by Sherman's Atlantic campaign. By single-track roads abounding in many wooden bridges and extending to Nashville, 300 miles distant, an army of over 100,000 men, and 35,000 horses and mules were amply provided, month after month, with all necessary supplies; and during all that time, notwithstanding many attempts were made to break the line of communication, they were attended with such trifling success, that all damage inflicted was easily and readily repaired. The astute commander of the Confederate forces repeatedly urged upon his government the vital importance of permanently disabling the roads, and advised that General Forrest with 5,000 cavalry should be assigned to that duty; but from the ill-feeling existing between the authorities at Richmond and Gen. Johnstone, the repeated appeals of the latter seem to have been utterly disregarded. In striking contrast to the wonderful energy displayed on this occasion by the Union quartermaster and commissaries at Nashville, was the glaring inefficiency of similar departments on the Confederate side. Lee's army, that of Northern Virginia, was suffering from short rations during the last two years of the war, and this evil rapidly increased as the end drew near. Long before Petersburg was evacuated it was greatly weakened by desertion. Thousands of the men composing it, undismayed by the shot and shell of the enemy, were not proof against the pangs of hunger. That there was no actual scarcity of provisions for the troops was amply proved after the Appomattox surrender. Many thousands of rations with other supplies stored along the line of railways in North Carolina after this event were destroyed by order of the Confederate authorities. That they never reached the hungry soldiers at Petersburg was simply owing to the notorious inefficieny of the men at the head of the quartermaster's and commissary departments. Many urgent demands were made for their removal, to which the President of the Confederacy paid not the slightest attention, apparently for the reason—if reason it was—that all such demands were direct personal insults to himself. This strange perversity was the cause of great disasters to the Confederacy. The fall of Vicksburg is by many considered mainy attributable to it.

The railways in the southern states suffered greatly during the war. Many of them were destroyed before it ended, and those which survived its ravages were in such wretched order that continual accidents and delays were frequent. When it is remembered that for four years no new rails or locomotives were furnished them, the wonder is that they performed so well the hard duty required of them by the government.

Passenger-coaches were first used for transporting troops, but these proving not nearly numerous enough the ordinary box freight-cars took their place. Many of them were in a filthy condition, infested with vermin and affording no protection from the rain, for their tin roofs were so perforated by holes made in them by bayonets that from a bird's-eye point of view, they looked like gigantic nutmeg-graters. No light was furnished save that from the lanterns of the conductors. A ride under these depressing circumstances, particulary when the sick and wounded were mixed up with the other passengers, was the very reverse of pleasant.

This language is, however, not strong enough to convey a correct idea of the horrors encountered by those compelled to take a long railway journey immediately after the great battles fought in Virginia. The depots then in Richmond were crowded, not only with sick and wounded soldiers, but with women, many of whom had left their distant homes as far off as Louisiana and Texas in search of their husbands reported "missing." Very few were successful in their search, and these poor

creatures, sick from want of sleep, disappointment and proper nourishment, presented a woebegone appearance which excited universal sympathy. Most of them had spent all their money in reaching Richmond, and relied entirely on free passages for their homeward journey—and they were freely granted.

The wounded soldiers were far more disagreeable passengers. Making themselves perfectly at home they crowded around the water-coolers in the cars, wetting their bloodstained bandages every few minutes with the scanty supply of drinking-water provided. They were, as a rule, quite cheerful. Probably the unlooked for pleasure of seeing their homes again, crippled as they were, made them so. When asked to show their furloughs many would hold up their mangled arms and hands in silence, and this mute way of replying seemed perfectly satisfactory. A close observer could not help noticing how many suffered from hands and fingers being amputated. A vague suspicion might naturally arise that these injuries were self-inflicted, but it was not so. They were evidently caused by carelessness—by the guns of the rear rank when formed in line of battle. The front rank extending their hands too far on the barrels of their rifles, had them blown off by the fire of their friends in the rear. Raw troops in their first battles suffer from this cause.

One or two box-cars on the trains carried a still more ghastly freight. They were filled with the dead bodies of officers and privates found upon the field. Most of them were so altered by decomposition that recognition was impossible, and in such cases articles of clothing were mainly relied upon to indentify them; but many mistakes were made and corpses carried hundreds of miles on railways and buried in church-yards by supposed weeping relatives and friends, were in reality those of the unknown dead. Metallic bath-tubs were sometimes used as coffins, and by covering over the top with sheet zinc and soldering them air-tight, these improvised sarcophigi proved very satisfactory—far more so than the pine boxes and saw-dust provided by the quartermaster's department.

The passengers on the trains had to suffer from the scarcity of good meals. Wretched as these meals were—consisting mainly in North Carolina of "cat fish and corn bread"—ten dollars was the price charged and readily obtained for them, the wounded soldiers thus paying a month's wages in the army for a dinner that under ordinary circumstances they would not care to eat. The Confederate Government refused to make its paper currency a legal tender, and it of course rapidly decreased in value. True such action would have been "unconstitutional," but not more so than the "Conscript bill" which was the cause of untold suffering. Mr. Chase was master of the situation when he boldly made greenbacks a substitute for gold and silver, and by doing so safely carried the United States through the financial difficulties of the war.

The railways, all of them in the south, had their largest customer in the government. All were worked to their fullest capacity in carrying troops and military supplies of all kinds, and the amount of currency received for these services was immense. Depreciated as it was in value, it was readily taken in exchange for real estate for the first three years of the war, and many sanguine railway stockholders confidently asserted that the roads were becoming rich by investing in houses and lands, as soon as received, the large sums due them from the government. Plantations and churches even all along the lines, were said to have been greedily bought by them, but these pleasing rumors were without foundation in most cases. It is more probable that the wise presidents and directors invested far more of the surplus funds in "8 per cent. bonds" than in real estate.

The railway employés were by no means as careful in transporting loaded shells, cartridges and gun-powder as they ought to have been. The barrels containing the latter extra hazardous ingredient were all in good condition when they left the arsenals, but the jolting on rough tracks frequently loosened the hoops, causing the heads to fall in. As there was not a cinder-proof car—at least during the latter part of the war—in the whole Confederacy, a spark from a locomotive might cause, on a train loaded with troops, its utter destruction, involving a loss of life even exceeding that caused by the mine fiasco at Petersburg. A knowledge of this fact was not calculated to increase the pleasures of an excursion hundreds of miles in length and performed in filthy cars crowded with troops whose wounds from long neglect were positively offensive. On one occasion two car loads of powder were being transferred from one railway to another and their dangerous condition was made known to the conductor who received them in charge, and who evidently was not deeply impressed with the risk he was encountering; but annoyed by the remonstrances made to him, he placed three cars loaded with prisoners next to those containing the powder, assuring his passengers in the rear of the train that they were in "but little danger." Passengers, powder and prisoners made the trip safely, and it is but right to mention that the latter were ignorant of their close proximity for hours to a leaky magazine.

Altogether the history of southern railways during the war of secession is a picturesque one, and more of interest could have been written on the subject than has yet appeared. The picture is not a pleasant one to contemplate, however, especially when the dreary condition of the roads at the end of the war is considered; but the comforting fact remains that the injury wrought southern roads by the conflict of years is rapidly disappearing. The revival of industry in the south has brought about wonderful improvements in its railway facilities, and of the effects of the war upon railways in that territory scarcely a trace now remains.

HOW NEW RAILWAYS ARE INAUGURATED IN ENGLAND.

RAILWAY legislation in England is and has been a long and tedious process, being almost as formidable a proceeding now as when Stepenson endeavored to convince less far seeing minds of the utility and advantages of railways over which people would be conveyed at the furious speed of ten or even fifteen miles an hour. The country already has a complete system of main lines, and these are naturally cautious of interference with each other's territory, and it is therefore by private parties principally that new lines are now promoted. Taken as a whole the proceedings are fair and impartial, politics do

not enter into the question at all, and the strong opposition from existing roads interfered with, competing schemes, landowners, and other interested parties, usually succeeds in bringing out the weak and faulty points in any project, while Parliament is, as a rule, averse to authorizing a line, the necessity for which, as well as whose good faith, is not fully sustained under the ordeal. It is practically useless to put dead-heads as directors in the bill, to make out a cooked estimate or bogus financial statements, or to make similar attempts to bolster up a lame scheme, since the engineers, lawyers and others of the opposition thrash the whole affair out as to the necessity, competition, operation, cost and other matters in detail, and then parade before the committee anything disadvantageous which they may discover; so that at the present time engineers and others have to tax their energies to the utmost in order to obtain the necessary act for their project; a natural consequence of which is that the leading men in the engineering and legal profession are much sought after by promoters, and both parties—but especially the latter—make, as a rule, a very good thing out of their parliamentary practice.

England is now so well provided with iron roads that the construction of trunk-lines is almost a thing of the past, and the majority of new lines which are now promoted are extensions and branches to shorten through routes, to afford additional accommodation, or to tap the more rural districts. Owing to the vast network of existing lines which spreads over the length and breadth of the country, it is almost impossible to lay out a line which does not interfere in any way with some railway or other, and this interference becomes an important item in the consideration of the route to be adopted, so as to avoid any unneccessary crossing or competition, as existing lines are very sensitive and will make a bitter opposition to any scheme which proposes to alter their levels or works in the slightest degree, while such opposition from existing companies is so powerful that it is wise to avoid it where-ever possible. This consideration, therefore, and the requirements of local landowners, fixes in a great measure the general route of the line, while the ordnance maps are so complete and extensive, and bear so much information, that with their aid and an inspection of the general route of the proposed road, the engineer can usually determine the center line pretty definitely, so that little or no preliminary surveying or location is necessary, except in the case of long and important lines; many minor lines are laid out for parliamentary purposes entirely by the ordnance maps. When the center line is approved by the promoters, it is laid down on an ordnance map of the 6 inches, or 25.344 inches to one mile scale, together with the "limits of deviation." These are imaginary lines parallel to the center line and usually 100 yards on each side of it, but are contracted, however, through towns, and sometimes also to avoid cutting into valuable property which would result in opposition from the owners, etc. The legal distance for such limits is 100 yards on each side of the center line in open country, and 10 yards on each side in towns; the distance is, however, occasionally put at more than 100 yards, but in such cases they are not properly limits of deviation, since the center line cannot be moved beyond the prescribed limits. This proceeding, however, has the effect of obtaining powers of compulsory purchase over the land and is therefore resorted to when extra ground is required for stations or other purposes. Trial levels are now taken over rough or bad ground, so that several sections may be plotted, and the most suitable position adopted for the center line.

The map, or a mounted tracing of it, is now taken into the field and corrected, new houses, roads, etc., surveyed in, and all other alterations made within the limits of deviation, errors beyond these limits being of no consequence, and in fact very little is shown beyond them; fences, etc., are, however, continued just beyond them to show their continuity. The scale of the plan must not be less than 4 inches to 1 mile, and if less than 400 feet to 1 inch, an enlarged plan on that scale, or a larger, must be given of every building, court-yard and premises situated within the "limits." In Scotland and Ireland, and for some unimportant lines in England, the 6 inches to 1 mile scale is adopted, but for the majority of lines the usual scale is the large ordnance of 25.344 inches to 1 mile, while for lines in the city of London, the 5 feet to a mile ordnance scale is principally used. Everything of a permanent character has to be shown, even down to ash-bins and foul-runs, if built into the ground; therefore, for a line running through any considerable amount of buildings the 25-inch scale (as it is usually termed) is by no means too large. When the plan is completed, correct tracings are made in lengths of about two feet, usually about a mile on a sheet, with a cut line at each end to show how it connects to the next sheet, the center line is marked by a thick black line with every furlong and mile numbered, the beginning and termination of curves marked, and their radii stated where less than a mile, and the names of counties, parishes and townships, etc., written on. The levels are then taken along the line, and cross-sections of all roads or railways which are to be interfered with have to be shown for 200 yards on each side of the center line. The section is plotted to the same horizontal scale as the plan, and for the 25-inch map has usually a vertical scale of 40, 50, or 60 feet to the inch. This section is divided up into the same lengths as the plan, and is generally printed on the same sheet, the plan above, and section below, with cross-sections between, which is a very convenient arrangement for reference. On the section the level of top of rails is shown by a thick black line, a datum is given at a certain depth below a stated bench mark, furlongs and miles are marked, the height at each end of every gradient and the inclination of the same is shown, the greatest depth of every cutting and height of every embankment is also marked, as well as the vertical distance from rail to surface at any road, river, canal or railway crossed by the proposed line, and the height and span of the arch at such points must also be stated. Tunnels are marked on the plan by a dotted line, and on the section are shown the intended height, and the length in yards is stated. Viaducts are also shown on the section. Where a junction is to be made with an existing line of railway, a plan and section of such line must be given for a distance of 800 yards on each side of the point of junction. Cross-sections are only required of roads whose levels are to be altered, and the amount of alteration must be stated, the inclination of present and altered approaches being also shown on the cross-section.

The plans are now lithographed, forming a book with pages about 30 inches by 18 inches, which are called the "deposited plans" from the fact of their being deposited

in the office of the houses of Parliament. Each house, road, field and other property is given a number on the plans, and a book is prepared, called the "book of reference," giving the number, description, owner, occupant and lessee of such property. Besides the deposited plans and book of reference, an estimate of the cost has to be prepared to a standard form, and, in certain copies of the deposited plans, an ordnance map of the 1 inch to a mile scale with the proposed line marked on in red must be bound up; these copies are for the clerks of the Parliament. Copies of the plans and reference book must be deposited on or before November 30th, and the estimate on or before December 31st, with the clerks of both houses of Parliament, and the clerk of each county in which the line is situated. Each parish clerk also has a copy of so much of the plans and reference book as affects his parish, and other copies have to be deposited with certain other parties, and in most cases the important land owners, local authorities, the engineer and manager of existing lines affected, and other parties interested are also supplied with copies. Previous to the 30th of November a notice of application to Parliament for permission to construct the line is published, containing a full description of the route of the same, defining its termini and giving the names of all counties, parishes, etc., roads altered or stopped up; and all such information must be published for one day in each of three consecutive weeks in some newspaper of each county in which the line is to be situated, as well as in the official "Gazette," and a London paper (Dublin for Ireland; and Edinburgh for Scotland). Notices of application must also be served on landowners, and others affected by the proposed line, on or before December 15th. After a week or two, during which the various plans and documents are arranged, they are opened to inspection at the private bill office in the House of Parliament, and for certain charges can be traced or copied in a room provided for the purpose, usually one of the committee rooms; and engineers of rival or competing lines can then obtain copies to compare with their own and look out for their rival's errors.

When the engineer, aided by the solicitor and parliamentary agent of his clients, has got all his plans, etc., safely deposited, and the deposit money paid (a certain percentage on the estimate), he begins to prepare for his opposition to rival lines, or others which he may be retained to oppose. For this purpose he gets a copy of plans, reference book and estimate if possible, or if not, gets them traced and copied at the private bill office or county clerk's office, and sends men into the field to detect errors, which are then carefully described and made as much of as possible by the solicitor in a memorial to the standing order committee, which memorial is lodged on January 9th, if the bill is numbered below 100, 16th of January if between 100 and 200, and 21st of January if above 200. Errors on plan, or in reference book, wrong numbers, numbers not corresponding in the same, omitting to give landowners notice, and similar cases, form pleas for non-compliance with standing orders. The examiners for standing orders sit in February and consider all the memorials and petition for and against each bill, in order to decide whether the rules embodied in the standing orders (certain standard rules to be complied with in every case, or only dispensed with by authority of the examiner), have been duly complied with, and reject or pass such bill, those rejected being *hors-de-combat* for that session. Appeal may, however, be made for re-examination, but this is very rarely granted; in doubtful cases the bill is submitted to the standing order committee, who give a final decision. From the examiner for standing orders of the House of Commons, the bill is carried to a similar official of the House of Lords, and if passed by both is then ready for the select committees.

Each committee is composed of five members, viz.: a chairman and four others, and has a certain group of bills to consider. They usually commence their operations about March (all bills going first before the Commons committee); and sit from 12 o'clock noon, till 4 P. M. each weekday except Saturday. The case is held in one of the committee rooms in the "House," the committee sitting behind a curved table, and the engineers, lawyers, counsellors, solicitors, parliamentary agents, short-hand writers, clerks, etc., sitting within a bar across the room, on the other side of which are the witnesses to be called. parties interested in the line, and the general public. Various witnesses are examined for and against the bill by the respective counsel, who also make long and exhaustive speeches. When the case for the bill is concluded the case for the opposition commences, after which the chief counsel of each party make their final speeches and after a (usually) brief deliberation the committee give it as their decision that the bill is, or is not, passed. Cases last from a few days to weeks, or even months, according to the length and importance of the line. If the bill is passed by the Commons it is carried before the Lords and the same performance gone through again; but if rejected by the Commons it is thrown out altogether, for that year's session at any rate.

During these operations the bill, which is a printed document setting forth the route of the line, names of promoters, amount of capital and other particulars, has had to be introduced into and read three times before each house, but unless the line is particularly important or noteworthy this is usually a mere matter of form. Should the bill be duly passed by the houses and their committees it is ready for the Queen's assent, upon receiving which it ceases to be a bill and becomes an Act of Parliament, in which form it is very different from its original, alterations having probably been made by each committee and stipulated requirements, as for accommodation works, etc., inserted, so that it is much more lengthy and contains more details than the original draft.

Summarizing these various stages: The line is projected probably in the summer or autumn; plans and reference book deposited, and notices published by November 30th; estimate deposited December 31st; memorials and petitions lodged 9th, 16th or 21st of January, the case goes before the examiner for standing orders in February or March, and reaches the committees sometime between March and August; the Queen's assent is obtained in August or September, and there is the Act of Parliament authorizing certain parties to build and maintain the A, B and C Railway. The act names the directors and promoters, states the capital and all financial details, nature of works, rates of tolls and fares, accommodations and all particulars, and when the line is a branch from an existing road a working agreement is frequently appended, stating the terms upon which the main company is to work the traffic on the new line.

The term for the completion of the work is usually put at five years (sometimes three). If the line is not completed in that time, an act for an extension of time may be obtained, or if neglected and no such act obtained, the company forfeits their interest in the work, as also the deposit money. An act for abandonment can be obtained which provides for the return of this money.

Preparations may now be made for letting the contract and starting the work.—[Edward E. R. Tratman, in the *Engineering News*.

RAILWAY STANDARDS.

THERE ought to be recognized standards in railroading as in everything else. What experience has proved to be the best should be generally adopted and no deviation permitted. Railways have increased in numbers and extent to such a degree, and their operations are so connected, that all thoughtful officials are convinced of the necessity for the adoption of a standard in appliances and methods.

There should be a standard of construction. We now have a gauge which has been adopted by all the northern railways and to which the southern roads are soon to be changed. A few lines exist which have the narrow gauge but they cannot long hold their own, for the economies of the traffic, which passes over several connecting roads, demand that no shifting of cargo or trucks be permitted. There is also a standard rail and a regulation size of tie. We might go further with advantage and have one style of construction which should be recognized as the best and to which all first-class railways should conform. Whenever this test becomes generally recognized, there will be established a code of rules governing the width of the right of way, form of embankment, size of ties and number to be used to the mile, weight of rails, length of sidings, and patterns of switches and signals. The form of stations, while uniformity is desirable for those on each road, will continue to be determined by choice and taste.

A standard for round-houses, freight-sheds, yards and shops will be selected and to this all will be made to conform as far as possible. As long as manufacturers compete with each other different styles will be used, but one type of construction will be universally adhered to as far as possible.

Standard equipment will be adopted. It is not so essential that every road have exactly the same kind of locomotives and passenger-cars as all the rest, but each line or division should have but the one style and the parts ought to be interchangeable. Time is lost and damage sustained because there are dozens of different kinds of locomotives in use upon the same road, and the shops must have patterns for the parts of each maker. If uniformity prevailed, parts could be kept in stock and in case of emergency be quickly attached.

It is more necessary that freight-cars be all of one standard, for they are shifted from one road to another and must each time be made up into trains. As it is now, some are high and some low, some have one kind of trucks and couplers and some another. Although there are many excellent automatic car-couplers known to railway master mechanics they cannot come into use because of this marked variance in cars. We want one size of wheels, style of trucks, drawbars and other appliances. Let them continue to come from the shops of different makers, each of whom will impress upon it his own individuality; but they must conform to one standard in all their parts which should be interchangeable.

There ought also to be a standard of operation. The first essential is a uniform system of bookkeeping so that all reports and statements can be easily understood and conceal no mysteries, known only to the uninitiated: the less of mystery there is about the accounts the better for all concerned.

Tickets, waybills and vouchering should be the same upon all the lines. We think the companies are inclined to come to this now, for the frequent conferences of the officials interested tend to the adoption of the forms most approved by experience.

This uniformity can only be accomplished by means of frequent meetings of railway men. The master mechanics and master car-builders now meet once or twice a year and so do even the conductors and brakemen. The freight men have gatherings as often as once or twice per month, while the general passenger agents for many years have held a semi-annual conclave of their National Association. The general superintendents also have their own special conferences.

These assemblies are not to be measured or tested by the amount of business apparently transacted, for this is a very superficial test. The meetings make those present acquainted and lessen the possibility for antagonisms; they furnish opportunities for explanations and consultation, so that when a meeting ends and it is said that nothing has been accomplished, the assertion is an unjust one, for the results cannot be immediately measured up and a value placed on them.

The presidents and general managers are beginning to see that a necessity exists for their frequent coming together. A cause of friction may be thus removed before it causes wide-spread dissatisfaction, and railway wars be so nipped in the bud. The railway interests of the country are immense and, unless care is used, at times conflicting. A conference of the principals will often remove a cause of dissatisfaction and restore harmony where correspondence could not avail.

Who can tell over the good results to come from the adoption of these standards as here advocated? Time would fail us to enumerate them. Sufficient it is to state two of the most conspicuous effects:

An economy of operation would result such as is now unknown or undreamt of. The ease with which parts of equipment could be interchanged, the greater clearness of knowledge, the more simplicity in methods, all would tend to that reduction in operating expenses which general managers so much desire.

The greater ease of operation would also be evident. The interchange of traffic and cars would be better accomplished with fewer delays and less friction. The dangers of accidents would also be decreased and property would consequently be safer. With a better knowledge on the part of the people with the workings of railways, there would be less inclination to interfere, and legislators would not interfere so frequently with vexatious laws.

By all means let us have these standards.—*Railway Register*.

Misleading Titles of Railways.

UNDER the caption of "What's in a Name?" a writer in the *Railway Review* strongly condems a number of corporate titles of American railways, and urges that their name should convey some idea of their routes. A foreigner, studying the guide-book to find the way to some distant point, would fare poorly, if he depended on the names of the railways to get to the point in question, For instance, let him be landed in New York and seek a way to Chicago. In the list of railways he would at once see, New York, Chicago and St. Louis. At once satisfied, he would immediately institute inquiries as to the location of the depot of that road in New York. He would be surprised indeed to learn that the nearest terminus of that road was over 500 miles from New York; also that it did not extend within 300 miles of St. Louis. Another misleading name is that of the Boston, Hoosac Tunnel and Western. This road does not touch a point mentioned in its coporate name. It is 153 miles from Boston, 1 mile from the Hoosac Tunnel and ceases 20 miles west of the Hudson river, remaining in the east, surely. Of the same class of names is the Western and Atlantic Railroad of Georgia, which neither reaches the Atlantic nor the west, its termini being Atlanta and Chattanooga. Another class of absolutely meaningless names exist, such as the Northern Central, the Southern Central and worse still the European and North American Railway, (now part of the Maine Central Railroad). This latter road has less than 200 miles of track, with a name good for over 3,000 miles of deep water.

The next class of names include those expressing truthfully the points they reach but which have grown way beyond their names, so that such a corporation will operate many hundreds of miles while the name covers but a few. Of these are the Philadelphia and Reading, with a 60-mile name, operating 1,458 miles, and the Boston and Lowell, with a 26-mile name, and a mileage of 550. The Chicago, Milwaukee and St. Paul is another road having originally a fine and instructive name for every traveler, but long since outgrown and now misleading for much of its vast territory.

Two names for railways come to mind which mean nothing unless one is either well posted in the early history of the country, or knows every city in it of over 20,000 inhabitants. The first reference is to the Old Colony, so named because it extends through the earliest settlements of New England, made famous by the Pilgrim Fathers. This road has one of the finest plants for local business in the world, with no competition and no entangling alliances with freight lines, pools, etc., and so makes money every year; but unless one lived close to it they might think in vain as to its location. The other reference is to the Fitchburg road, which from its location and business suffers much more from a meaningless name than does the Old Colony, which can flourish without much outside help. The Fitchburg is one of New England's principal arteries to the west, but it bears the name of a little city on its line which few people have heard or know of, and with the location of which still fewer are familiar, yet the road reaches Boston and extends to the famous Hoosac Tunnel, with a direct connection for Troy via a shorter, but better named road, the Troy and Boston. Why the name of such an insignificant place as Fitchburg should have been given to a railway will always remain a mystery to stranger travelers. Had it been Boston and Fitchburg it would have shed some light on its location. Its greatest competitor bears one of the most perfect and instructive of railway titles, viz.: Boston and Albany—a whole story of itself. Equally fortunate in name is the Boston and Providence, the Philadelphia, Wilmington and Baltimore and other titles which include names of extreme terminal points. A wider but good and truthful class of names are the Boston and Maine, Baltimore and Ohio, Chicago and Eastern Illinois, and Chicago and Northwestern (the latter a blanket title, in truth). A class, local and yet broad enough, includes the various "Centrals"—New York Central, Maine Central, Central of New Jersey, Michigan Central, etc., to which everyone would look if about to travel in those states. With these should be included the Pennsylvania.

It is supposed to be allowable to attach the word "western" or "northern" etc., to any road leading in either of those directions. This is in better taste than that of the originators of the "Big 4," road which sails under the title of Cincinnati, Indianapolis, St. Louis and Chicago, reaching but the first two of these cities and pointing towards the last two. Fully as presumptuous a name is that of the Boston, Concord, Montreal and White Mountains (now a part of Boston and Lowell) which reaches neither Boston nor Montreal and operates only about 100 miles of road. Of long names for short roads, a most amusing one is the Bedford, Springfield, Owensburg and Bloomfield, which impressive title used to cover an Indiana road only 42 miles long—narrow gauge at that. The name was too great a burden for the road and it was re-organized and is now called the Bedford and Bloomfield. For ambition, the Beach. Haven, International, Transcontinental and Intercolonial Railway, the title of a recent New Jersey project, appears to deserve the palm. One of our best-named roads is the New York, West Shore and Buffalo, as is also its parellel and greatest competitor, and many others that could be named. In fact this subject could be carried on at a great length, but enough has been written to call attention to the incongruous and misleading naming of a large percentage of our railways.

Railways in Central Asia.

THE Central Asiatic Railway will now be pushed forward very energetically, in pursuance of the recent imperial order. Gen. Annenkoff, charged with the direction of the necessary works, has already started for the Trans-Caspian, and has reached there before this time. Great attention is paid in Russian circles to this railway, which will be of the utmost importance, not only strategically, but also in its relation to commerce. The line will go in a direct southeastern direction to Kakhka, which place is about half-way between Askabad and Sarakhs, but then the road will take a northeasterly direction to Merv and further to Bourdalik, on. Amu-Daria. In this way the railway, which has hitherto closely followed the Persian frontier, will suddenly branch off at an angle and be continued to a distance of about 50 miles from the new Russo-Afghan boundary, which is thought will be settled by the negotiations between England and Russia. The considerations which have determined the

government to choose this direction for the railway are commercial ones, and the line now will be connected with the principal fluvial communications in the Russian possessions in Central Asia, also with the great caravan roads. The expenses of keeping up the railway will be serious. They are calculated at nearly 2,000,000 roubles a year, and during the first year or two the receipts will scarcely amount to 200,000. After that time, when the Central Asiatic merchants have learned to appreciate the new means of communication, the traffic may be expected to increase largely. It is said on good authority that the Central Asiatic railway will be continued next year across the Bokharian territory to Samarkand, and from thence to Tashkend, the residence of the Turkestan Governor-General. The distance between the two towns is 260 English miles.

Origin of Petroleum.

As to the origin of petroleum, scientific men are by no means agreed. In the early period of American oil mining the only question much debated was whether it was of animal or vegetable origin, or both. Of late, however, a theory has been started that the oil is not due to the storage of organic remains under the surface, but that it originated from chemical combinations of carbon and hydrogen in the interior of the earth. This view of the subject has been taken up in consequence of petroleum having been found in such large masses as almost to preclude the idea of its origin in animal or vegetable deposits. If this be true, it is probable that the oil exists in still larger quanties than any which have yet been observed.

Canadian Branch Lines.

WHAT branch lines have been and are to the transcontinental lines in the United States, is seen in the facts presented by Mr. Chapleau, in the Canadian legislature. Out of a total of 16,277 miles, comprising the mileage of the seven different railways in that country working their way from the Atlantic to the Pacific, 6,775 miles are branch lines. Of a total of 1,442,800 tons carried by the Northern Pacific only 67,275 tons were through freight. The Union Pacific had $10,427,540 of local freight against $2,512,507 of through traffic. The Central Pacific carried 814,700,000 pounds of through and 3,888,308,000 pounds of local freight.

Pacific Railroad Earnings.

THE Secretary of the Treasury has issued a circular publishing, for the information and guidance of all concerned, the recent decision of Second Comptroller Maynard in regard to compensation due the Central Pacific Railroad Company for services rendered the Government, and announcing in accordance therewith that Department Circular of June 27th, 1883, and Circular Letter of January 12th, 1884, are revoked, and that all compensation now due or which may hereafter become due that company, will be covered into the Treasury and one-half thereof applied to the extinguishment of interest which has meanwhile accrued on the Government Subsidy Bonds, and the other half credited to the Sinking Fund, as required by the Thurman act.

Valuation of the Philadelphia and Reading's New Jersey Property.

TESTIMONY is now being taken at the office of the Philadelphia and Reading Railroad, in this city, in the matter of the valuation of the property of that road in the State of New Jersey, as assessed by the State Board of Assessors for the purpose of taxation, and to whose valuation the road took exception. A large array of counsel is present on both sides. The State is represented by Attorney-General Stockton, Barker Gummere, W. S. Gummere, Wm. Corbin, ex-Judge Hoffman and Robert Stockton. The Philadelphia and Reading Railroad is represented by ex-Chancellor Williamson, R. W. De Forrest and Mr. Kaercher, and the Long Branch Railroad by George M. Robeson, while A. G. Ritchie appears for the Delaware and Bound Brook Railroad.

Coke as Locomotive Fuel.

TWO locomotives on the New York, Lake Erie and Western road are now being run experimentally with coke, with a view to testing that fuel for use on passenger-trains. The two engines in question are at present running on one of the express-trains between Jersey City and Port Jervis, on the Eastern Division.

Strong and Weak Woods.

THE strongest wood in the United States, according to Prof. Sargent, is that of the nutmeg hickory of the Arkansas region, and the weakest the West Indian birch (*bur seva*), The most elastic is the tamarack, the white or shellbark hickory standing far below it. The least elastic and the lowest in specific gravity is the wood of the *Ficus aurea*. The highest specific gravity, upon which in general depends value as fuel, is attained by the bluewood of Texas (*condalia obovata*).

A Novelty in Railways.

AN air-balloon railway is about to be constructed in Switzerland, on the Gaisberg, near Salzberg, a mountain of no great height, but offering a magnificent view over the beautiful neighborhood of the town. The balloon, which will have grooved wheels on one side of its car, will ascend to a perpendicular line of rails, constructed on the principal of the wire-rope railway invented years ago for the Rigi, but never put in operation.

The First Railway in San Domingo.

A RAILWAY is being built from Samana bay to Santiago de los Caballeros, in the island of San Domingo. Of the total 88 miles 40 are now graded, and it is expected to have 65 miles in operation by next spring. The road runs along the Yuna river, up the valley of La Vega Real, and will be the first on the island. The road is purely a private enterprise in the hands of British capitalists.

The Great Canals of the World.

THE Imperial Canal of China is over 1,000 miles long. In the year of 1861 was completed the greatest undertaking of the kind on the European continent, the Canal

of Languedoc, or the Canal du Midi, to connect the Atlantic with the Mediterranean; its length is 148 miles, it has more than 100 locks and about 50 aqueducts, and its highest part is no less than 600 feet above the sea; it is navigable for vessels of upward of 600 tons. The largest ship canal in Europe is the great North Holland Canal, completed in 1825; it is 125 feet wide at the water surface, 31 feet wide at the bottom, and has a depth of 20 feet. It extends from Amsterdam to the Helder, 51 miles. The Caledonia Canal, in Scotland, has a total length of 60 miles, including three lakes. The Suez Canal is 88 miles long, of which 66 miles are actual canal. The Erie Canal is 350½ miles long; the Ohio Canal, Cleveland to Portsmouth, 332; the Miami and Erie, Cincinnati to Toledo, 291; and the Wabash and Erie, Evansville to the Ohio line, 374.

Taking up Tickets on Sleeping-Cars.

THE following notice, recently issued to conductors by General Passenger and Ticket Agent St. John, of the Chicago, Rock Island and Pacific road, is of general interest:

"Your attention is called to rule 52 in book of instructions, which reads as follows:

"'52. We do not desire that passengers holding through tickets, and occupying berths or sections in the Pullman palace sleeping-cars shall be unnecessarily annoyed after they have retired, and to prevent such annoyance the Pullman palace-car conductor is instructed to take up the tickets of all passengers in his car on retiring, and hold them for the examination of and proper cancelling by the conductor in charge of the train, who will ascertain by personal observation that he has a ticket or pass for each passenger, and then return them to the sleeping-car conductor for delivery to the passengers in the morning, unless they expire on his division, in which case he will, if necessary, take them up.'

"I want to impress upon you the necessity for making a personal examination as to the number of passengers in the sleeping-cars on your trains, and while the greatest care must be taken to avoid in any way offending the occupant of any berth or unnecessarily disturbing passengers after retiring, you must, with the assistance of the sleeping-car conductor, satisfy yourselves that you have a ticket or pass for each passenger. Sleeping-car conductors have been instructed to coöperate with you in this matter. The fact that the company has been defrauded in a great many cases recently is an indisputable one."

Old Locomotives.

A RECENT issue of the *National Car-Builder*, mentions a number of instances where old locomotives are still doing active service. The Illinois Central road has twelve Rogers locomotives in service that have been running over 30 years, and they still have the original boilers in use. Most of these engines are light, weighing about 25 tons, and have cylinders 15 × 22 inches and wheels 5 feet in diameter. The engines are now getting too light for the work on the road and they will probably be cut up within a very few years, and the company can well afford to put the engines aside, for few locomotives have earned an equal amount of money. The oldest engine still running on the road is a Rogers make, which has been in service 33 years. Nearly 30 years ago this engine was run for some time by Mr. Morris Sellers, the well-known railway supply dealer, and at that early day the engine was regarded as a wonder among locomotives, owing to the astonishing weight of trains she could pull.

A Chat About Car-Wheels.

AN official of the Pennsylvania Railroad stated recently that there are fully 10,000,000 iron car-wheels in use on American railways. That figure does not include the wheels on palace-cars and the better class of passenger-cars.

"How much iron does it take to make a wheel?" he was asked.

"About 525 pounds of pig-iron," he replied, "and about 1,250,000 wheels are worn out every year. But do not conclude from that that the iron men are called upon to supply the 312,500 tons of material required to make the new wheels; because the worn-out wheels themselves supply about 290,000 tons."

"How long will a good car-wheel last?"

"Formerly it would last eight years. But now the reduction of railroads to a standard-gauge and the improvement in loading and unloading facilities keep the length of service down. This is because the uniformity in gauge keeps the cars in more continuous use, and the improvement in loading and unloading facilities enables the cars to be put to more active service. The wheels on palace-coaches and on first-class passenger-coaches are known as paper wheels. They are made with a steel rim or flange, and iron hub; but the web is composed of sheets of paper cemented together. They combine lightness with strength."

Time on Lake Constance.

THE lake of Constance is only some fifty miles in length, but any one who travels from pier to pier and wishes to know the right time of day at each ought to carry five watches. Its waters wash the shores of five different states—Austria, Baden, Wurtenburg, Bavaria, and the Swiss Federation. If you land at Rorschach and want to catch the train for Ragatz or Chur, your watch ought to stand at Bern time. In Friedrichshafen you must know the Stuttgart time, in Constance the Baden time, in Lindau the Munich time. The Austrian time is not reckoned from Vienna, but from Prague, which differs no less than twenty-eight minutes from the Bern time. Hence a traveler crossing over the Austrian frontier at St. Margareten must put back his watch half-an-hour in order to set himself right at the Swiss station. This non-conformity among the clocks may be an amusement, or merely a slight inconvenience, to the tourist, but it must be a serious hindrance to the men of business in this centre of increasing international traffic.

Railway and Steamship Speed.

IT seems rather absurd to talk about a steamship beating a railway-train in a long-distance contest, says a local newspaper, but it begins to look as though it might happen. It is already a fact that the fastest boats

on the transatlantic lines make almost as good time as the Pacifie railway lines do from the Missouri river to the western coast. From Omaha to San Francisco, by the Union and Central Pacific lines, is a distance of 1,928 miles, or about two-thirds the distance between Queenstown and Sandy Hook. The schedule time by the fastest train between Omaha and San Francisco is eighty-eight hours, lacking ten minutes, which makes the average rate of speed a trifle under twenty-one miles per hour. The *Etruria*, on her recent trip, which "beat the record," made an average across the Atlantic of 445 miles per day, or almost exactly nineteen miles per hour. The steamship has thus come within three miles an hour of the transcontinental train, and as the time of the ocean passage is being steadily cut down, it looks as though one would before long cross the Atlantic as rapidly as he can get across the western part of the continent.

Railway Subsidy in Colombia.

A CORRESPONDENT of the *New York Herald* says that the United States of Colombia, with a surplus revenue of only $1,000,000, have undertaken the following subsidized projects:

1. A railway from Cauca to the Pacific, of which 30 miles have been constructed.
2. A railway from Cundinamarca to the Magdalena river, 15 miles built.
3. A railway from the Magdalena to the capital of the State of Antioquia, 48 miles built.
4. A railway between the upper and lower portions of the Magdalena, where navigation is interrupted by the rapids, 16 miles built.
5. A railway from Santander to the Magdalena, 6 miles built.
6. Railways from the sea coast to Barranquilla and Clenaga, in the States of Bolivar and Magdalena, 32 miles built.

A Telegraphic Railway.

AN ingenious Philadelphian has invented a device for telegraphing passengers and goods through the air, which is described in the Bulletin of the Inventor's Exhibition at Philadelphia: "The field it proposes to occupy is a comparatively narrow and modest one, as it does not seek to rival the locomotive, but is satisfied with the prospect of operating in districts incapable of furnishing traffic adequate to the support of a railway. Sturdy posts may perhaps be called its road-bed, as they support its two cables, one of which is about eight feet higher than the other, additional cables being supplied to insure absolute safety. The cars are suspended from the upper and supported by the lower cable. Steam-engines and dynamos at each end of the line supply the driving-power, and by means of the car-wheel axles and intervening wires the current is passed through an electrical motor working under or by the side of the car. The carrying capacity of the cable varies, inclusive of cars, from several hundredweight up to a ton, and repeated tests have demonstrated that smooth and swift motion can be attained. During its stay at Manly & Cooper's, on Forty-second street and Elm avenue, this curious appliance attracted much attention. Our personal experience fully confirms the statement of our esteemed contemporary, the *Ledger*, that 'A system of light carriage of paseengers by electricity like this, or such as this might be developed into, appears to be a desideratum for places in the suburbs of cities, and especially for the park.'"

The Car-Coupling Tests at Buffalo.

THE car-coupling tests conducted by the executive committee of the Master Car-Builders' Association commenced at Buffalo, N. Y., on September 15th, and continued for three days. In all forty-six patent couplers were submitted for trial, and they were subjected to thorough and severe tests under all practical conditions. The following of the number were recommended by the committee for further tests and will be put in practical use until the next meeting of the association: Ames, Archer, *Cowell*, *Dowling*, Gifford, *Hien*, *Janney*, McKean, Marks, Perry, *Thurmond* and *Titus & Bossinger*. Six of these twelve devices are link-and-pin couplers and six vertical-hook couplers, the latter being indicated in italics.

America Claims the Honor.

[COMMUNICATED.]

Editor American Railroad Journal:

DEAR SIR:—In your August issue, the heading of the article "The Longest Draw-Span in the World" is an error. The Raritan Bay Point Span on the New York & Long Branch Railroad, over Raritan Bay, N. J., is 472 feet long, weighing 600 tons. It was designed by J. H. Linville and built by the Keystone Bridge Co., in 1875.

Yours respectfully,
JONES & BENNER,
Engineers and Contractors.

PHILADELPHIA, PA., September 4th, 1885.

THE first train on the Syracuse, Phœnix and Oswego Railroad ran on September 7th. The road has been leased to the Rome, Watertown and Odgensburg company, and and runs to Syracuse, using parts of the New York and Oswego, and Rome, Watertown and Oswego tracks, and will compete with the Delaware, Lackawanna and Western road.

A CORRESPONDENT of the Boston *Globe* urges the building of iron or steel railway-cars. Because steel ships have been a decided success, he infers that steel cars would be the same, and claims that they would be more secure against fire and telescoping than wooden cars.

THE first "tea-train" over the Northern Pacific left Tacoma, August 8, and reached New York City, August 17, making the run in 8 days and 4 hours, the distance being 3,378 miles. This is the fastest record ever made by a freight-train for so long a distance.

The Novelties Exhibition of the Franklin Institute is now in successful operation in Philadelphia. The exhibition will remain open until October 31st, and special railway rates are offered by the management for excursions from a distance.

THE Pennsylvania Railroad is introducing steam steering-gear in the ferry-boats which ply between Jersey City and Cortlandt and Desbrosses streets, New York.

IT is announced that the Quettah (India) railway is to be at one extended 30 miles, and perhaps to Candahar.

American Railroad Journal.

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Principal Contents of this Number.

THE PARALLEL ROAD.

A CONTRIBUTOR in this month's issue dwells feelingly upon the subject of "paralleling," and sums up the evils resulting in the simple phrase, "Two into One—No Times, with Nothing Over." That covers the ground. The present era of railway receiverships, the unsatisfactory record of railway operation during the past year and the business depression generally, perhaps put us in a reflective mood and we are greater philosophers than we were in the hey-day of our prosperity. Therefore we are disposed to accept home truths when they are presented. But whether we are prepared to take time by the forelock and guard against similar depression in the future, is another question. We confess that things are not as they should be, but we are not quite ready to say what is best to be done to put them on a right footing.

In truth the subject of railway paralleling is a ticklish one to handle. A railway corporation has certain rights and privileges and it is proper that they should exercise them to the fullest extent; but legislatures are reluctant—and well they may be in this anti-monopolistic age—to bestow exclusive privileges upon any railway. It may be true that the business through one section of territory is sufficient for one road only, and that the construction of a parallel road will lead to the bankruptcy of one or both; but it is neither wise nor advantageous to a commonwealth to enact that one road shall have perpetnal monopoly through such territory. The time may come and probably will when the requirements of trade and travel will demand the construction of a rival road and who shall be the judge as to when such a period has arrived? It has been suggested that the earnings of a road shall be the basis of its claim to exclusive rights, and that so long as its profits do not exceed a certain percentage of the capital invested so long shall a rival road be prohibited. But it is an easy thing to circumvent a favorable showing and keep the profits just within the prescribed limits.

The legislator as well as the investor is confronted with a practical problem, a solution to which is difficult to obtain. On the one hand there is a pressing necessity for such action and legislative enactment as will insure a road a fair field of operation where a reasonable profit can be obtained. The incorporation of a road gives it a certain claim upon the state for reasonable protection and the interests of the state are conserved by its just treatment of its corporations. On the other hand there is the well-grounded fear of monopoly that is always present when exclusive rights are granted. More than one state has reason to curse its folly when it considers its helplessness regarding the encroachments of corporations with perpetual and exclusive charters granted years ago.

Who, then, shall lead us to the right path and solve the

pressing question of railway rivalry? The question must be solved and the railway industry must be put on a different footing, but the Moses is yet to appear. Certainly he should not be a railway capitalist whose sole aim is to secure heavy returns from his invested millions, nor yet an anti-monopolist who imagines that railway construction and operation is at best a species of extortion. Some happy compromise candidate between these two extremes should achieve the mosaic distinction, and we await with expectant interest the utterance of some unknown who will eventually set things straight.

But in the meantime common-sense will do much, and common-sense should teach us that there is a vast difference between a competing road and a parallel road. To be sure, a parallel road is always a competing road, but a competing road is not necessarily a parallel road; and for convenience the word parallel has been given a stigma in railway parlance. The competing road is a legitimate and often friendly rival. It is organized and constructed for the purpose of obtaining business where it thinks there is a chance to secure a profit, and the fact that another road is already obtaining business in its contemplated field is duly considered and the chances for both doing a profitable business carefully calculated. Generally the new road hopes to obtain the bulk of business through some intended superiority either in directness of route and consequent short time, or through other adventitious circumstances. The builders of the road take their chances and stand or fall according to the correctness of their judgment.

The parallel road, per contra, is a pirate. A parcel of fools could lay out a parallel road, and it would probably answer the purpose for which it was constructed quite as well as if the wisest heads in the country had planned it. Its sole object is to injure another road and inaugurate a battle of purses. The richer road will hold out the longest, and the poorer must eventually go to the wall and be swallowed up. To the projectors of the parallel road it makes little difference how much capital is wasted in the struggle. They argue, and their argument is sound, that the world is pretty largely peopled with lunatics where investment is concerned, and that no wild-cat railway scheme ever fell through from lack of stockholders. Not infrequently also, the parallel road is constructed with other ends in view; with the avowed purpose that the rival road shall purchase it, a pleasant blackmailing feature being thus introduced.

A competing road and a rival road are two very different institutions and should be very differently considered. Perhaps when their precise relative status is established the aforementioned railway Moses will appear and solve the question of railway rivalry in a direct and comprehensive manner. In the meantime there need be no fear. The solution will be reached sometime, and that sometime is almost here. It is related of a traveler in the western districts that he observed a boy digging vigorously in an opening near a sparsely settled town. "What are you digging for, boy?" asked the traveler. "A woodchuck," answered the youth curtly. "Do you expect to get him?" was asked. "Got to get him!" was the answer, "our family is out of meat." The solution of the railway problem is a species of woodchuck. It must be reached; the railways are out of "meat."

THE CAR-COUPLING TEST.

THE car-coupling test conducted by the executive committee of the Master Car-Builders' Association, at Buffalo, has resulted in demonstrating the impracticability of a large number of coupling devices, and in the recommendation for further trial of a dozen that proved successful under the rigid conditions of the test. As far as it went the test was a good thing, but we are not disposed to assume that the couplers singled out for approval represent the only reliable and practical coupling devices that have been invented. The expense of the test to each inventor was considerable, and it is fair to assume that the inventors of devices of equal merit to those recommended, were deterred from entering their couplers for tests through lack of funds. The coupling question is not yet solved.

TERMINAL EXPENSES AT NEW YORK.

NOT long since the writer stood upon a North river ferry-boat and observed a seeming wise-acre point to the Jersey shore and in a regretful tone remark to a companion: "It's a pity there is not more water-front there. A new road from the south or west would be unable to secure an independent outlet for its New York terminus." Possibly the wise-acre could not be much blamed for his remark, and quite possibly ten out of every dozen persons would think the impossibility of securing an independent terminus at New York an insuperable obstacle to the successful construction of a road desiring to reach the metropolis. In the old days it is quite possible that a railway itself would regard such impossibilities as an obstacle, but times have changed. When, as is stated, the expense of maintenance of the Pennsylvania road's New York terminus is upwards of one-half the total expense of maintenance of the entire line between Jersey City and Philadelphia, and when it costs as much and often more to transport freight across the North river as it does to carry it the rest of the way to Philadelphia, the independent terminus seems to be a species of white elephant. Certain it is that the roads recently acquiring termini of their own at New York have steadily reported losses thereon, and the sweet sense of ownership is not without

its drawbacks. Terminal expenses are terrible things to contemplate, and a road should have ample justification before it seeks to acquire an entrance of its own into New York.

In sober truth, there seems to be no reason why a line reaching New York over the line of another road should branch out for an independent connection unless it is subjected to extortion and injustice, for terminal expenses falling on several roads can be easier met. The minimum of terminal expenses are enormous and every additional terminus increases the competition, and consequently tends to reduce rates. A road having a satisfactory contract for obtaining access to New York had better let well enough alone. When their business becomes so great that they cannot be accomodated, then there is time enough to talk about independent connections. But the increasing business can better afford to wait for accomodation than increased accomodation for business.

EDITORIAL NOTES.

THE International Railroad Conference which met in Brussels last month, as might have been expected, did not accomplish much of practical benefit to American railways, nor, do we believe, to the railway systems of any of the twenty-two countries represented in its deliberations. The reports of the discussions have not been received at length, but it is evident that if there were twenty-two countries represented, there were twenty-two ways of looking at the questions considered, and, doubtless, each way is the best for its respective country.. The time is not yet for the adoption of universal railway rules and regulations, and while the conference commands our respect as a representative gathering of railway men, it was more ornamental than useful. The time will come when the deliberations of such a conference will be of practical benefit.

* * *

CHICAGO now boasts of being the greatest railway center of the world and proudly points to the twenty-two roads running into the city. Chicago has many things to boast of, but this is the most unanswerable of her claims to preëminence. The railway and the city are about coeval in existence, and in the short space of fifty years this mushroom, inland city, as our English friends are wont to characterize it, ranks first in the magnitude of its railway operations.

* * *

MISERY loves company, and in the midst of our dreary railway prospects we can extract some few grains of comfort from the fact that our transatlantic neighbors are quite as badly off. The French railways show a decrease of earnings during the past half-year, from the earnings during the corresponding period of 1884, of 3.87 per cent.; the Spanish railways a decrease of 3 per cent.; and twenty leading British lines a decrease of 2.19 per cent. The only great powers whose railways show an increase in earnings are Germany and Italy, the former but a meagre increase of .03 per cent., while the South Italian lines give a comfortable increase of 7.1 per cent. The increase of mileage among European railways has been slight, and the general average of their condition is not much better than that of our own roads. The past year has apparently been a bad one for railways everywhere.

* * *

ONE feature of the speed question has been satisfactorily settled, and despite the boasting of our English brethren that they run the fastest railway-trains in the world, they must, perforce, take a back seat when it comes to yachting. The *Puritan* is to-day probably the fastest sloop afloat, and we may rest assured that many years will elapse before our cherished *America* Cup will be taken from us. We have also a sneaking idea that if such a thing were possible as an actual test of speed between representative American and British railway-trains, we could surprise our friends across the water with a superiority they do not suspect, or, at least, do not admit. We would greatly like to match these two trains on one of our great lines and then let them run 1,000 miles "to windward and return," and would back America in the contest.

* * *

THE Philadelphia and Reading road has issued a time-table in modified form, the stations being printed across the top and the trains across the side, reversing the usual order of time-tables. On the whole it seems a decided improvement, and we are somewhat surprised that such a modification has not been thought of before.

* * *

WE take pleasure in announcing that the series of papers on "Railway Medical Service," published in the JOURNAL some months ago, will be resumed, and that our October issue will contain the first of the new series. The author, Dr. S. S. HERRICK, secretary of the State Board of Health of Louisiana, has prepared them with great care, and they cannot fail to prove of practical benefit to our readers.

* * *

A VERY sensible order has been issued by the superintendent of the Louisville and Nashville road, that the watches of every engineer shall be inspected and condemned if not found to be accurate time-pieces. An inspector and general time-keeper has been appointed, and already several of the engineers have had their watches condemned as unreliable and untrustworthy. Truly it is said that a poor time-piece is worse than none

at all, and it is also safe to say that more than one disastrous accident has occurred on railways owing to the error of a few minutes in the time reckoned by the engineer. But would it not be better for each road to supply every engineer with a chronometer of such excellence that the correct time may be furnished by the railways themselves? That would be putting the responsibility where it should belong.

CASSELL & Co.'s *Magazine of Art* continues to take the lead among art journals, and the October number is a most artistic issue. In every detail the magazine is worthy of the art it represents and is a most attractive expontent of the engraver's skill. The letter press is excellent as usual, and the contributions of interest and value. *The Quiver* for October, published by the same house, is also an excellent number.

UNDER the savory title of *The Cook*, the housekeeper is at last furnished with a "trade paper." That cooking is a trade, and a difficult one at that, is undisputed, and this lively little journal, published in this city by the Cook Publishing Company, has achieved a wonderful popularity in the six short months of its existence. Its "Menus for the Week" are sorely tempting reading and have a marked effect upon the hungry reader.

N. W. AYER & SONS' *American Newspaper Annual*, for 1885, is published as a large octavo of 996 pages and presents a carefully prepared list of all newspapers and periodicals published in the United States and Canada. In the arrangement and character of the information furnished this annual is one of the best of its class, and of great value to the systematic advertiser.

"THE Application of Wire Rope Tramways for Purposes of Economical Transportation," is the title of an interesting little illustrated pamphlet by F. C. Roberts, C. E., published by the Trenton Iron Co., of Trenton, N. J. The system is thoroughly discussed therein, and its advantages enumerated at length.

A MOST useful little work is the "National Standard Encyclopedia," published A. L. Burt, at 162 William street, New York. The volume is an abridged yet complete encyclopedia, embracing upwards of 20,000 subjects in every department of knowledge, and furnished with over 1,000 illustrations. It is sold for $1.

The Monetary Times and Trade Review, of Toronto, Canada, recently celebrated its nineteenth year of publication. *The Times* is steadily improving and widening its sphere of usefulness, and is among the first of Canadian financial journals.

UNDER the title of "Some Facts About Patent Leather, Which May be Worth Reading," Messrs. E. H. Reynolds & Co., of Newark, N. J., publish an interesting little pamphlet describing the entire process of manufacture of patent leather.

A NEW and interesting exchange is received in the *Black Diamond*, a monthly journal published in Chicago by the National Coal Exchange, and devoted to the interests of the coal trade industry.

The Railroad Telegrapher is a well-edited little monthly published at La Porte City, Iowa.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

CONVENTION OF THE AMERICAN STREET-RAILWAY ASSOCIATION.

ELSEWHERE we call the attention of our readers to the approaching fourth annual meeting of the American Street-Railway Association, to be held in St. Louis on the 21st of October. As will be seen, the preparations are in active progress, and every indication points to a large and influential gathering of representatives of American street-railways, and the topics to be discussed are those of vital interest to every company.

It is gratifying to note the marked increase of membership in the association during the past year, and that one-fourth of all American street-railways are now enrolled as members. But where are the remaining three-fourths? Doubtless in representation by capital, the association has far more than one-half the total capital invested in street-railways represented in its membership, and the non-members are chiefly small and unimportant companies; but none the less are they to be pitied for their indifference with regard to the national association. Whether a street-railway company be large or small, whether it runs one car or one hundred, whether it is one mile long or ten miles long, there are certain subjects to be considered that are of as great an importance to a small line as to a large one. The vexed questions which are discussed and carefully reported upon by committees at the meetings of the association are those which have occupied the attention of street-railway officials for years, and until the organization of the American Association, no means existed to secure concerted action in their consideration and settlement. Since the organization of the association, these questions have been discussed in the light of the most thorough experience in every important American city, and the companies are able for the first time to know the general experience of all lines before reaching definite conclusions. The beneficial results of such knowledge have been made manifest in many ways, but no more striking instance is shown than in the organization of the American Street-Railway Mutual Insurance Company. For years the street-railways of this

country have been paying exorbitant premiums upon their policies of fire insurance, amounting, as has been demonstrated, to more than twice the actual cost of such insurance. Probably the companies would have gone on until the end of time and continued to pay these extravagant premiums in ignorance of the injustice done them by the insurance companies, had not the organization of the American Street-Railway Association instituted an inquiry in this direction, resulting in the exposure of the exorbitant rates charged, and almost immediately thereafter in the organization of an insurance company by street-railway men and for street-railway men, offering insurance at reasonable rates and cutting down premiums nearly one-half.

We could instance other results following the organization of the American Street-Railway Association all tending to show the benefits to be secured from membership, and we are strong in our appeals to all companies to acquire it. At a nominal cost, the privileges of membership are placed at the disposal of every road, and each road has an equal voice in deliberations of the association irrespective of its capital or of the magnitude of its operations. It is safe to say that no single road could obtain the information furnished at a meeting of the association for ten times the cost of membership, and we issue a warning notice to the three hundred and fifty street-railways of the country that have not yet become members of the association that they are wasting valuable time. The time to join the association is now—not next year nor the year after,

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BROADWAY has no sooner been favored with a surface road than, as might have been expected, a scheme is on foot to construct a similar road on Fifth avenue. Naturally this scheme meets with hearty opposition, much of which is well-founded and much ill-founded. There is a class of persons who will oppose anything and everything simply for the sake of being on the side of opposition, and this class has its customary say in antagonism to the Fifth avenue road; but there is a large class of property-owners along the cherished thoroughfare who do not seem to view the contemplated road with favor, and certainly the opinion of these persons are worthy of every consideration. It is, however, folly to claim that that portion of Fifth avenue lying south of Madison square is any longer a street of residences exclusively, and a possible compromise may be effected in constructing the line of the road only through such portion of the avenue. Trade has crept in alarmingly in Fifth avenue below Twenty-third street, and if the majority of property-owners on that portion of the street desire a street-railway to be built thereon, there is no reason why they should not have it.

OFFICIAL RECOGNITION OF STREET-RAILWAY IMPROVEMENTS.

BY F. MARTIN GAYLER.

[Written for the AMERICAN RAILROAD JOURNAL.]

ON the eve of the approaching convention of the American Street-Railway Association I would like to offer a suggestion to that honorable body whose power and usefulness to street-railway interests has long since been recognized. From an inspection of the last annual report of the association it appears that the organization is in a most satisfactory shape and is prepared to grapple with all street-railway problems until a successful solution is reached; and it has occurred to me that the association could do much to stimulate the inventive spirit among street-railway men in every capacity, if it were to offer yearly premiums to be awarded to those who furnished the best practical improvements in street-railway methods and devices. The amount of the premium need not be large, but the knowledge that official recognition awaits meritorious improvements in street-railway methods would prove a great incentive to the production of such improvements.

Whether the premiums should be general, allowing the competitor every latitude as to the nature of the device or improvement; whether it should be limited to one single feature at a time, or whether several premiums for a corresponding number of devices should be offered, are questions of detail that can readily be settled at the convention and by the association, but, in general terms, the premium system commends itself to me as a practical system by which the association can accomplish much in the way of street-railway improvement.

In the matter of cars, for instance, a premium could be offered for the best practical model of a street-car submitted to a committee, who shall act as judges, This committee can be so organized that their dictum as to the best model submitted would be final. Such decision would not, in any way, bind the association or its individual members to the adoption of the model, but would merely indicate as the judgment of the foremost street-railway men in the country that a certain model of a street-car was the best that had been presented during the year, with reference to its practicablility, to the arrangements for heating, lighting and ventilation, and to other important questions. Similarly other features of street-railway improvement could be considered and a powerful stimulus offered to the devising of practical betterments.

The constitution of the committees and the nature of the premiums—whether in the shape of money or of medals—are questions of secondary importance; but the main feature of the system has, to me at least, much to commend it. The American Street-Railway Association is aiming at the general improvement and economy of street-railway operation, and by this plan it would be able, at small expense and with little trouble, to institute a general spirit of improvement among street-railway operatives in every capacity.

To suggest a practical method of offering the premiums is perhaps not a provine of mine, but as an instance of the needs of street-railway operation of the present time I can refer to the premium list of the National Railway Exposition, held in Chicago, in 1883. The street-

railway interests were not forgotten and the following premiums were offered in this connection:

Best Iron Wheel	Silver Medal.
Best Combination Wheel	Silver Medal.
Best Rail	Silver Medal.
Best Rail-Joint	Silver Medal.
Best Car	Gold Medal.
Best Car-Spring	Silver Medal.
Best Draw-Spring	Bronze Medal.
Best Street-Car Gong	Bronze Medal.
Best Bell-Cord and Fixtures Complete	Bronze Medal.
Best Fare-Box	Silver Medal.
Best Center Lamp	Silver Medal.
Best End Lamp	Bronze Medal.
Best Hand-Rail Bracket	Bronze Medal.
Best Hand-Rail Socket	Bronze Medal.
Best Journal Bearing	Bronze Medal.
Best Door-Lock	Bronze Medal.
Best Window Fixtures	Bronze Medal.
Best Window-Blinds Complete	Bronze Medal.
Best Registering Punch	Bronze Medal.
Best Registering Device	Bronze Medal.
Best Track-Cleaner	Silver Medal.
Best Sheave for Sliding-Door	Bronze Medal.
Best Change-Gate	Bronze Medal.
Best Door-Hook and Plate	Bronze Medal.
Best Door-Handle	Bronze Medal.
Best Door-Roller	Bronze Medal.
Best Hame-Bell	Bronze Medal.

The adoption of this list, with proper modifications, would be a practical way of encouraging and fostering improvements, and the award of premiums by the American Street-Railway Association, the national authority on street-railway questions, would be of more pronounced benefit than the award by the exposition in question, great as was the interest taken in the latter. The subject is at least worthy of careful consideration.

TAXATION OF STREET-RAILWAY PROPERTY.

BY A. D. ROGERS.

[A Paper read before the Convention of the Ohio State Tramway Association.]

THIS is a practical question which concerns us all, and in view of the high rates of taxation in our cities, is of considerable importance. A few suggestions, of little value in themselves, perhaps, may elicit information and discussion, and thus be made profitable.

It is not expected, I presume, that this paper shall deal with the question *abstractly*, but rather with the methods under existing laws for ascertaining values of our property subject to taxation. No attempt has ever been made, so far as I know, to impose taxes for *general purposes* upon anything belonging to such corporations except their tangible property, and as to *assessments* for *special purposes*, I may say in passing, though perhaps foreign to my subject, that it is difficult to conceive of any principle under our laws authorizing their imposition upon such corporations except upon their real estate. Yet the claim has recently been advanced in the discussion of a project for widening a street in this city upon which a line of street-railroad is operated, that the company owning such line may, in addition to its real estate, be assessed for a portion of the cost of the improvement, but upon what—whether right of way in the street, considered as an easement, or upon the company's franchise, or what else, is matter for conjecture. The claim, however, is an absurdity, and is only mentioned to show the disposition sometimes manifested towards us.

Aside from our real estate, which, of course, is appraised as all other real estate, and without reference to its particular use, the chief items of taxation belonging to our companies are *Track, Horses* and *Cars*. Let us consider the matter of their valuation for taxation in the order named.

Track. I have no information either as to valuations in the different cities or the rules by which they have been made. They must vary considerably in cost in various localties and even as to different lines in the same city, according to the description and cost of materials, labor, etc. The question at once presents itself—how far should cost of construction govern the appraisement? Unquestionably a fair proportion of the value of the materials placed in the streets for the exclusive use of such companies should be included in the estimate, allowing, of course, for wear and decay.

In addition to such materials the *labor* on our structure and the *paving* required in connection therewith are the only items of expense. But the labor is largely expended in connection with the paving, and, therefore, as we view it, constitutes a small factor in the calculation. Paving is generally required of us as part of the consideration of our privileges in the streets. We maintain a portion of the street, but we use this portion only in common with the public. We can claim nothing except that which is peculiar to our business. In some cities companies are required by their contracts with city authorities to pay in money for their privileges and are relieved of all care of the streets. It certainly will not be claimed in such cases that paving should be embraced in such estimates. Yet this differs from the more common arrangement as stated, only in the method of rendering to the city the same equivalent. In making these estimates, then, there should be excluded from cost of construction all the expense except materials for our exclusive use and the labor necessary to place them in the street.

The public often have an exaggerated idea as to our profits, and this consideration sometimes seems to influence officials in passing upon our returns to increase valuations on that account; but this, even if such opinions are well-founded, is wholly unwarranted. In effect it would be the imposition of a tax upon our business, which is not admissible under our laws.

Horses. As to these we know they cost a great deal of money. We know also that they soon wear out. All that intelligent care can accomplish is done to prolong the period of their usefulness, but our records show clearly that their longevity for our purposes is limited to a very few years—less, probably, than one-fourth of that common in other employments. Large allowance should be made in all estimates of value for this constant shrinkage. The average value of all the horses in our respective counties as they are returned for taxation should afford some guide to us in making our returns. It will be conceded by every one familiar with the matter that a considerable discount should be made from this average if we are to pay only a fair share of taxes on this species of property.

Cars. Of these little need be said. They are peculiar to our business and outside of it are comparatively without value. Their first cost is large, yet by reason of great exposure they rapidly deteriorate. They should bear taxation on a very small proportion of their original cost.

Having thus particularized let me, in conclusion, say a word in this connection generally. The business of these corporations is of a public nature. They are the servants of the people, and all classes enjoy their benefits and contribute to their support. In view of this relation have we not a right to expect of public officials, as the agents of the people, hearty good will, and in their dealings with us the utmost fairness—even liberality? Happily for us, such, I think, has been the disposition generally manifested towards us. Let us hope that it may always prevail, and that the obligations we have assumed may thus be morally reinforced, resulting in the best possible service.

Third Annual Meeting of the Street-Railway Association of the State of New York.

THE third annual meeting of the Street-Railway Association of the State of New York was held at the United States Hotel, Saratoga Springs, N. Y., on Tuesday, September 1st. The association now numbers as members twenty-six street-railway companies of the state, nearly all of which were represented at the meeting, three new members joining. The membership of the association further represents three-fourths of the paid up capital stock of New York State companies, and the organization is in a flourishing condition.

The following papers were read in the form of reports of special committees: "Heating and Lighting," by C. Densmore Wyman (vice-president, Central Park, North and East River Railroad Company, New York); "Labor and Wages," by D. B. Hasbrouck (secretary and treasurer, Houston, West Street and Pavonia Ferry Railroad Company, New York); and "Rules for Railroad Employés," by D. F. Lewis (secretary and treasurer, Brooklyn City Railroad Company, Brooklyn).

The following officers of the association were elected for the ensuing year:

President, Henry M. Watson (president, Buffalo Street-Railroad Company, Buffalo); First Vice-President, C. Densmore Wyman (vice-president, Central Park, North and East River Railroad Company, New York); Second Vice-President, Chauncey C. Woodworth (secretary, Rochester City and Brighton Railroad Company, Rochester); Secretary and Treasurer, William J. Richardson (secretary, Atlantic Avenue Railroad Company, Brooklyn); Executive Committee, the president, secretary and treasurer, and Jacob Sharp (president, Twenty-third street Railway and Christopher and Tenth Street Railway Companies, New York); Lewis Lyon (president, Third Avenue Railroad Company, New York), and William H. Hays (president, Eighth and Ninth Avenue Railroad Companies, New York).

The fourth annual meeting of the association will be held in New York City, on Tuesday, September 21st, 1886.

The Approaching Fourth Annual Meeting of the American Street-Railway Association.

THE fourth annual meeting of the American Street-Railway Association will be held at the Southern Hotel, St. Louis, Mo., commencing on Wednesday, October 21st, at 10 A. M., and continuing in session for two and possibly three days. Preparations are completed for the accommodation and entertainment of those attending, and the street-railway companies of St. Louis are taking an active interest in combining with the executive committee of the association to insure a large and successful convention.

Reports will be submitted at the meeting by special committees on the following subjects: "Diseases Common to Car-Horses and their Treatment;" "Progress of the Cable System of Motive-Power;" "Progress of Electricity as a Motive-Power;" "Repairs of Tracks;" "Rules Governing Conductors and Drivers;" "Taxation and License," and "Ventilation, Lighting and Care of Cars."

A few days since a representative of the JOURNAL called upon Mr. William J. Richardson, the secretary of the association, at his office in Brooklyn, and was informed that the approaching convention would, in all probability, be the largest yet held. The membership of the association now numbers one hundred and twenty-four street-railway companies, having doubled during and since the last meeting. A further increase of membership by fifty or sixty companies is expected during the coming year. Nearly every State is represented in the membership and several Canadian street-railway companies are also enrolled.

Secretary Richardson further stated that he was in correspondence with the managers of the New York Central to arrange for a reduction of fare over its road and connecting lines, from all the principal cities between Boston and St. Louis, to all representatives of members of the association who intend being present at the meeting, and that as soon as these arrangements were completed he would send out a general notice of such reduction and the manner in which tickets can be secured.

The rates thus far obtained are as follows: Boston and Worcester, $25; Springfield, Mass, $24; New York, Albany and Schenectady, $20; Utica and Syracuse, $19; Rochester, $18.

As heretofore, invitations to attend the meeting have been sent to every street-railway company in the United States and Canada, and Mr. Richardson is laboring indefatigably to render the meeting one of marked success.

Fourth Annual Meeting of the Ohio State Tramway Association.

THE fourth annual meeting of the Ohio State Tramway Association will be held in Toledo, Ohio. on Wednesday, November 18th, under the auspices of the Metropolitan Railway Company of that city. Arrangements for the meeting are not definitely completed, but a good attendance is expected and a number of interesting reports and papers will be submitted and read. The subjects of these reports and papers have not yet been fully chosen.

The American Street-Railway Mutual Insurance Company.

No meeting of the directors of the American Street-Railway Mutual Insurance Company was held during the summer months, but at the meeting on the 24th inst., matters of importance were considered. The next meeting of the directors will be held at the Southern Hotel, St. Louis, Mo., on Tuesday, October 20th, 1885, at 8 o'clock, P. M.

The Original Cable Road Patent.

MR. JOHN H. GOULD, of Philadelphia, Pa., whose combined railway track-support, etc., is described in the department of New Inventions this month, writes the JOURNAL that he was one of the patentees of the first patent granted for underground cable roads. He says:

"I beg to add that I am one of the patentees for improvement in tracks of city railways, now called cable railways, which was issued in March, 1858, (No. 19,736) the same under which the Cable Railway Company of San Francisco is now operating its several lines and exacting royalties from other traction companies, to which, in consequence of the priority of my patent, they have no right, as the subsequent patents are of no avail. Unfortunately through lack of enterprise on the part of railroad men in this city and by reason of my large interests in the furniture trade, this patent expired without having been put to use. Of course I could claim damages if I could prove the fact that any of these cable railways were operated prior to the expiration of my patent. In reference to patent No. 19,736, I would further state that this is the original patent for underground cable railroads."

The Daft Electric System.

A DAFT electric motor is now being experimentally run upon the New York elevated roads, and its operation thus far gives many indications of its future adoption. The Hampden Branch of the Union Passenger Railway Company, of Baltimore, Md., is now being successfully operated by the Daft system.

Repairing Pavements.

COMMISSIONER of Public Works Squire, of this city, has sent a letter to the various surface railway companies upon their duty to repair the pavements along their routes. The commissioner says that after the past severe winter, during which the street-pavements were, in addition to the ordinary wear and tear, subjected to the influence of many storms, extreme cold, and rapid changes of temperature, the various streets are in need of extensive repairs. It is the duty of the street-railway companies to maintain the pavements in and about their tracks, of which they have the almost exclusive use. The companies are called upon by Mr. Squire to do this work at once.

The St. Louis Cable Road.

CONSIDERABLE difficulty is being met with just now in the construction of the cable railway in St. Louis, Mo. In excavating for the conduit between Channing and Cardinal avenues an 18-inch water-pipe, extending pretty nearly the whole distance, has been encountered, a little to the north of what is to be the center line between the two tracks. This water main must be unearthed, disjointed, refitted and placed in position a few feet to the north of the old line to be out of the way of the cable. The connections with private residences and fire-plugs will have to be made, and pretty much the same process must be followed in making the necessary changes in gas mains and their vast network of feeders that reach out toward the curb-line on either side of the street.

Another obstacle that has lately been discovered is the faultily constructed cast iron chairs to hold the T-rails in position at the extreme ends of the yoke. The chairs are either too narrow to receive the rail, or the base of the rail has been rolled too wide to pass into the chair slot intended to hold it in place.

About a block of the tubing has been placed in the ditch made to receive it, but the job of inclosing it with concrete has not been commenced. This is probably owing to the fact that the rails can not be put in position with the placing of the tubing, as was originally intended, to expedite the completion of the track. Had none of these difficulties arisen, a construction-train would have been put upon the rails, with a steam apparatus for mixing the concrete even more rapidly than it could be used by a force of fifty men with shovels.

Steam-Motors Approved.

[COMMUNICATED.]

OFFICE OF THE CONCORD HORSE RAILROAD.

Editor American Railroad Journal:

DEAR SIR:—I noticed an article in your August number under the head of "Street Railway Notes," relating to the use of steam-motors on the Concord, (N. H.) Street-Railroad Company. The statement there made is not correct; on the contrary, the motors are very popular with our citizens. There were a few opposed to them on personal grounds and they applied to the legislature and also to the city government to have them pass a law stopping the motors, but failed in both cases, we getting a unanimous vote in both bodies to allow the motors to run.

Yours truly,

MOSES HUMPHREY, President.

CONCORD, N. H., September 9th, 1885.

STREET-RAILWAY NOTES.

THE Southern Boulevard Street-Railroad Company was incorporated recently. It is to operate a road in New York City along the boulevard from the iron bridges across the Harlem River on the line of Third avenue to Boston avenue. The length is three-and-one-half miles. The capital stock is $250,000.

THE board of management of the American Exposition, New Orleans, has sent out notifications to various electric railway companies of the intention of the management to have an electric railway upon the Exposition grounds, and inviting bids from the companies.

THE Manhattan Railway Company operating the elevated roads of New York City, carried over its lines from October 1st, 1884, to September 22d, 1885, both days inclusive, 100,975,356 passengers.

IN the department of New Inventions of this month's JOURNAL, are published descriptions of a combined track-support and traction-cable and electric-conductors conduits, and of a fare-box register.

THE Cable Commissioners have rendered a unanimous report in favor of cable railways in this city. The entire proposed system which they advocate embraces twenty-nine different routes.

THE City Council of Peducah, Ky., have authorized a street-car company to construct and operate lines on Broadway, Broad, Walnut and Trimble streets. Work is to begin immediately.

THE scheme to build a horse-railway in New Rochelle, N. Y., is receiving ample encouragement, and there is no doubt about the early construction of a line from the depot to the Sound.

THE Hudson County (N. J.) elevated cable road, running from the ferry at Hoboken up Union Hill, is expected to be put in operation early in October.

New Inventions.

Handlan's Locomotive Head-Light.

ALEXANDER H. HANDLAN, Jr., of St. Louis, Mo., is the inventor of an improved form of locomotive head-light which is herewith illustrated and described. The inventor furnishes a signal-chamber and also means for securing signal-plates or glasses in position, while the signal-chamber is placed within the rim of the lantern instead of in front of the rim, as is customary, thus obviating a change in the contour of the body of the lantern.

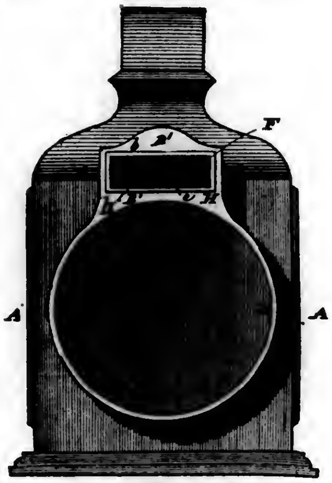


Fig. 1.

HANDLAN'S LOCOMOTIVE HEAD-LIGHT.

In the accompanying cuts, Fig. 1 is a front view of a head-light embodying the invention; Fig. 2 a side view thereof, a portion being removed; Fig. 3 a horizontal section of the signal-chamber on the line 3 3 in Fig. 1, and Fig. 4 a detail vertical section on the line 4 4 in Fig. 3.

A represents the body, C the reflector, and D the semaphore, of a head-light, which may be of any approved

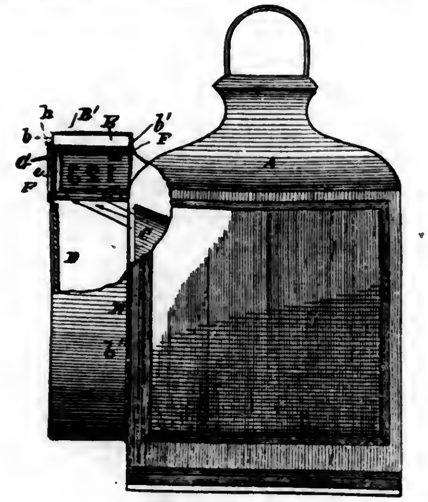


Fig. 2.

HANDLAN'S LOCOMOTIVE HEAD-LIGHT.

construction. B is the rim, having a top extension B′, forming a signal-chamber E, in front of the body, open at the bottom. The rim is formed with a front plate *b*, a rear plate *b′*, and a broad connecting-band *b″*, extending up and over the signal-chamber to obviate the necessity of cutting away the rim or body in the rear of the signal-chamber, thus forming the signal-chamber in one with the chamber in the rear of the semaphore. The signal-chamber E, is rectangular in horizontal section, and is solid on the rear side, while the front and sides have openings for the reception of the front signal *e*, and the side signals *e′ e′*. Frames H, having flanges *h*, are placed in the openings, to receive the signal-plates, which are held in the frames by means of clamp-plates I, removably and ad-

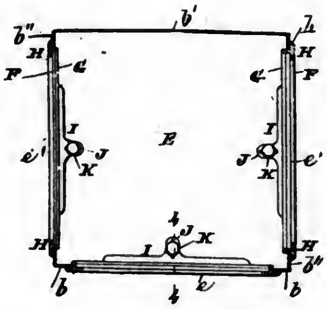


Fig. 3.

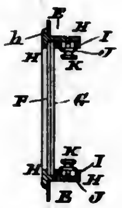


Fig. 4.

HANDLAN'S LOCOMOTIVE HEAD-LIGHT.

justably secured to the interior of the frames by set-screws K, passing through slots J, in the plates, and screwing into the frames, as shown more clearly in Figs. 3 and 4. As signal-plates it is preferable to use numbered glass plates F, and ground-glass plates G, behind them, and the outer glass should preferably be made black, except the lettered portion.

By this construction of rim signal-chamber, a flattened, broad signal-box is provided which can receive direct rays of light from the reflector being located within the rim, between the front and rear plates and contiguous to the reflector, without interfering with the ordinary circular semaphore, the signals being independent thereof, while at the same time they receive their light wholly through its chamber.

Though but recently patented, this head-light is claimed to be giving entire satisfaction, and it is stated that it is in use on one-third of the railway mileage of the country.

The device is now controlled and manufactured by M. M. Buck & Co., of St. Louis.

Clark's Rail-Support, or Tie.

JOHN K. CLARK, of Buffalo, N. Y., is the inventor of an improved rail-support, or tie for railways, which is herewith illustrated and described. The objects of the device are to avoid the use of wooden ties; to provide means for connecting metallic rail-supports, whereby is provided a solid bearing and a base for the ballast; a tie-plate and means for connecting two opposite metallic rail-supports; a continuous or unbroken bearing of the rail-supports and the connecting tie-plate on the road-bed, and to provide such construction and union of parts that a practically solid structure is secured, adapted to rest squarely and evenly on the road-bed and be properly confined in position by the ballast.

In the accompanying cuts, Fig. 1 is a perspective view of two of the rail-supports and connecting tie-plate, comprising the completed tie; Fig. 2 a detached perspective view of one of the rail-supports; Fig. 3 a detached perspective view of the tie-plate, and Fig. 4 a vertical sectional view of one of the rail-supports, showing a modification of the invention.

Each of the rail-supports is composed of a horizontal bottom wall or base number 1, vertical side walls 2, a transverse top plate 3, to which the rail is secured, and a central vertical web 4, journaled to the top plate and the bottom and side walls, the side walls being inclined from the end of the top plate to the ends of the bottom plate, whereby is provided a narrow top bearing-surface for the rail as compared to the extended base which rests on the road-bed. The bottom plate is formed with a rectangular plate, as well as bring the parts flush to preserve the continuity of the bearing of the structure on the road-bed, and also obtain a broad or extended and continuous bearing on the road-bed between the supports, the whole constituting a solid structure or tie from end to end. The ballast—such as broken stones, etc.—is packed into the supports and upon the tie-plate, and as the latter rests on the road-bed in line with the bases of the supports, a firm and substantial railway-tie is produced.

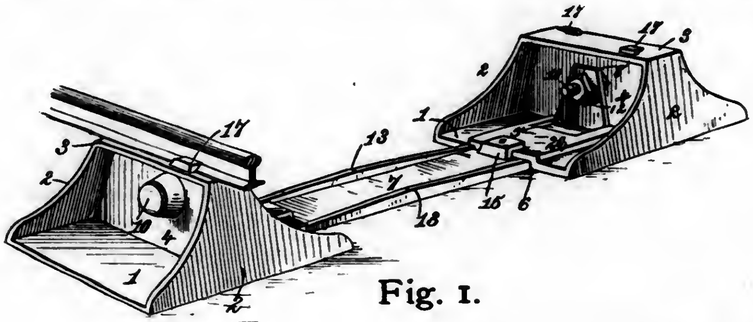


Fig. 1.

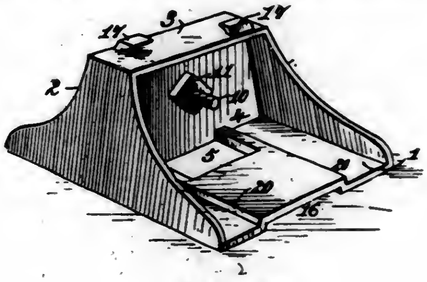


Fig. 2.

CLARK'S RAIL-SUPPORT, OR TIE.

slot or perforation 5, adjacent to the web 4, and the under side of the wall is formed with a rectilinear recess extending from the web to the end of the wall to constitute a depressed seat 6, for receiving one end of the tie-plate 7, so that when the latter is in the seat its lower surface may be flush with the lower surface of the support. The tie-plate is rectilinear in shape, and at each end is provided with a standard 8, formed as a flange, having a perforation 9, adjacent to its upper extremity, such standards passing through the perforations 5, in the bottom walls and engaging bolts 10, secured to the webs of the supports. These bolts are provided with heads and pass through the webs, to which they are attached at their inner end portions by screw-nuts 11, leaving the project-

The manner of connecting the rails with the top plate may be through the medium of the diagonally-arranged overhanging lugs 17, forming part of the top plate, as shown in Figs. 1 and 2 of the drawings; or the rails may be connected with the top plates by hooked screw-bolts, as shown in Fig. 5. In this example the top plate will be provided with square or angular orifices, through which pass the square shanks of the hooks 18, the hooks engaging the flanges of the rails, and the shanks of the hooks having screw-threaded extremities engaging screw-nuts 19, under the top plates of the supports, so that by screwing up the nuts the hooks clamp the rail-flanges on the top plate, while the angular form of the hook-shanks and angular sockets in the top plate prevent the hooks from

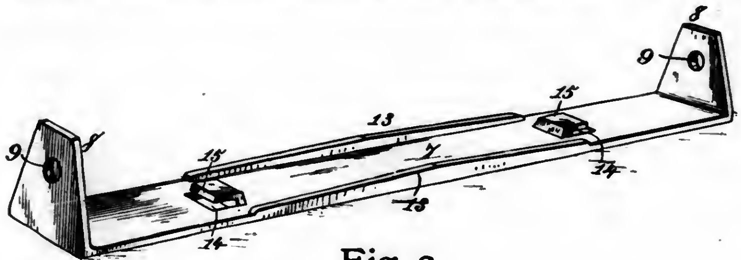


Fig. 3.

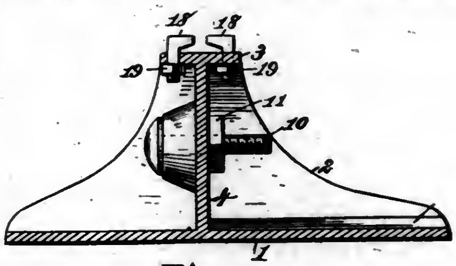


Fig. 4.

CLARK'S RAIL-SUPPORT, OR TIE.

ing threaded portion of the bolt to pass through the standards of the tie-plates and engage screw-nuts 12, which screw up against the standards to clamp them against the nuts 11. The tie-plates are ribbed longitudinally along their margins, as at 13, to provide strength, and are formed with two orifices 14, and raised lips 15, which project in opposite directions and respectively overlap the recessed ends of the bottom walls of the supports to hold such ends down and secure a strong and substantial connection of the parts. The object of the orifices is to permit the lips 15, to be formed by punching or molding up the metal, thereby forming the lips and creating the orifices.

The ends of the tie-plate, being seated in depressed seats in the bottom walls of the supports, prevent any lateral movement of the support in relation to the tie-

turning in any direction. The orifices for the bolts 10, and for the hooks 18, will be cored out during the process of casting the rail-supports to avoid the expense of drilling. The depressed seats in the bottom walls of the rail-supports are formed by raising the metal of the walls, as at 20, thus imparting a bridged or angular form to the walls, so that they are of uniform thickness and considerably strengthened.

Stitzel's Stuffing-Box.

FREDERICK STITZEL, of Louisville, Ky., is the inventor of an improved stuffing-box, which is herewith illustrated and described. The object of the invention is to provide means, readily accessible on the outside of stuffing-boxes, for tightening up the packing as it becomes loose, without

removing any of the parts; and it consists in a stuffing-box, the gland of which is made movable longitudinally to the piston-rod by a worm and worm-wheel mechanism to be operated from outside the box to compress the packing.

In the accompanying cuts, Fig. 1 is a vertical longitudinal section of the device; Fig. 2 a vertical cross-section in the plane of the line *x x*, Fig. 1; and Fig. 3 a bottom plan view with relation to Figs. 1 and 2. Fig. 4 is a vertical longitudinal section of another form of the device; Fig. 5 a vertical cross-section thereof in the plane of the line elevation of and Fig. 6 an end elevation. Fig. 7 is an end *y y*, Fig. 4; still another form, on a smaller scale.

Fig. 1.

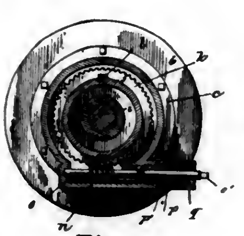


Fig. 2.

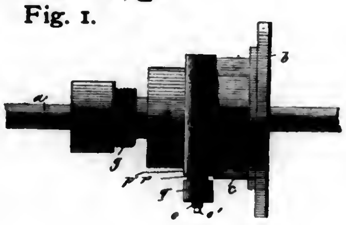


Fig. 3.

STITZEL'S STUFFING-BOX.

A portion of a piston-rod *a*, and the head *b*, of its cylinder are shown. To the head *b*, is bolted the bonnet *b*, which is shouldered at *d*, and within the space covered by this bonnet, the cylinder-head has an annular bead or lugs *e*, and also an exteriorly screw-threaded annular chambered boss *f*. The bonnet is also provided with a similar (preferably smaller) boss *g*, at its outer end. The chamber of the boss *f*, receives packing *h*, of suitable sort, which is retained therein by the gland *i*, and this gland is held up to the packing, adjustably in the direction of its length, by a flanged nut *j*, which engages the screw-threads of the boss *f*, to this end, The nut *j*, is encircled by a worm-wheel *k*, and the two are engaged to turn together by feathers or splines *l*, on the outer surface of the nut. This, or any equivalent mode of connection of the nut and worm-wheel, will permit the nut to travel in the direction of its length on the boss *f*, as it is rotated by the worm-wheel. The worm-wheel is a worm-toothed annulus, and it is held in place on one side by the bonnet, (as by its shoulder *d*,) and on the other by an annular band or equivalent support *m*, which in turn is held in place by the bead or lugs *e*, on the cylinder-head *b*. The worm-wheel is rotated by the worm *n*, on the shaft *o*, which is suitably supported in the bonnet and provided with facilities for rotating it outside of the bonnet. This worm-shaft, as shown, is stepped at one end in the foot of the tubular portion *c'*, of the bonnet *c*, and supported at its other end in a bushing *p*, tapped into the tubular portion *c'*, to close it air, gas, or steam-tight; and to insure further the tightness of this stoppering the bushing is provided with an annular flange *p'*, which fits over the mouth of the tubular portion *c'*, and which receives the screw-threaded cap *q*, between which and the end and flange of the bushing, packing may be interposed, as indicated in Fig. 2.

The worm-shaft *o*, has the end *o'*, projecting beyond the bushing and cap, and squared to receive a wrench, whereby it may be rotated, and it is obvious that rotating the worm-shaft in one direction turns the worm-wheel, and it the nut, and drives the nut toward the cylinder-head, and that the nut consequently forces the gland *i*, in the same direction, either by rotation or otherwise, and tightens up the packing, and all this is done without any removal of parts and consequent stoppage of machinery. Hence it will appear that the rod may be kept always packed tight and leakage reduced to a minimum, if not altogether stopped or avoided. To insure further against leakage, the bonnet is extended, as before described, into the boss *g*, and this boss receives in its chamber suitable packing, which is kept tight by a gland *r*, and its nut *s*.

In the stuffing-box shown Figs. 4, 5 and 6, while the main features of the previously-described box are retained, various structural modifications are shown. The cylinder-head *b*, has the chambered boss *f*, with packing *h*, and a gland *i*; but the boss is enlarged laterally at *f'*, to form the base of the bonnet *c*, and this bonnet is bolted to the enlargement leaving a rim *m'*, which takes the place and serves the purposes of the annular band *m*. The flange of the gland is extended laterally and perforated at diametrically opposite points, and through these perforations the screws *t t*, loosely pass. These screws are fixed against rotation in any suitable manner in the boss and bonnet, and are each provided with a nut *j'*, one end of each of which nuts bears against the flange of the gland. Each of these nuts is provided with a worm-wheel

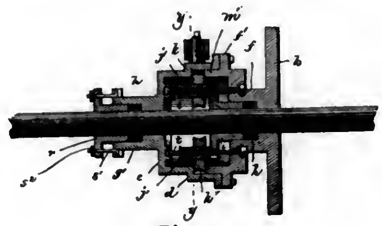


Fig. 4.

Fig. 5.

Fig. 6.

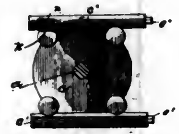


Fig. 7.

STITZEL'S STUFFING-BOX.

k, fitted thereon to turn it, this fitting being here shown as square. Each worm-wheel is engaged by a worm *n*, on the worm-shaft *o*, arranged substantially as in the former case. It is obvious that the rotation of the worm-shaft in one direction will so turn the worm-wheels and their engaged nuts *j' j'*, as to drive the nuts toward the cylinder-head, and hence force the gland in the same direction and so compress the packing *h*. The terminal boss *g'*, of the bonnet is chambered and provided with packing, but its gland *r*, is adjustably held therein by screw-hooks or bolts *s'*, engaging its flange, and secured by nuts s^2.

In Fig. 7 an arrangement is shown which is simply the doubling of the screws, nuts, worm-wheels, worms, and worm-shafts of the last above-described box. It is also

obvious that three independent sets of screws, worm-wheels, worms, worm-shafts, etc., may be used.

This mode of keeping the packing of rods tight is particularly advantageous in gas compressors for ice machinery, but it may also be applied to all kinds of machinery where it is important to keep tight joints to prevent leakage through stuffing-boxes.

The device is now controlled by the inventor and by Adolph Reutlinger and Moses Schwartz, of Louisville, Ky., to whom two-thirds of the patent-rights have been assigned.

Ellis' Railway Bumping-Post.

ELISHA W. ELLIS, of Lake, Ill., is the inventor of an improved railway bumping-post, which is herewith illustrated described. In the accompanying cuts, Fig. 1 is a side elevation of the device, and Fig. 2 a plan view.

A represents the sleepers or ties of a railway-track; E E the rails of a railway-track, and H the bumping-post, set in the ground and anchored there. F is a wooden

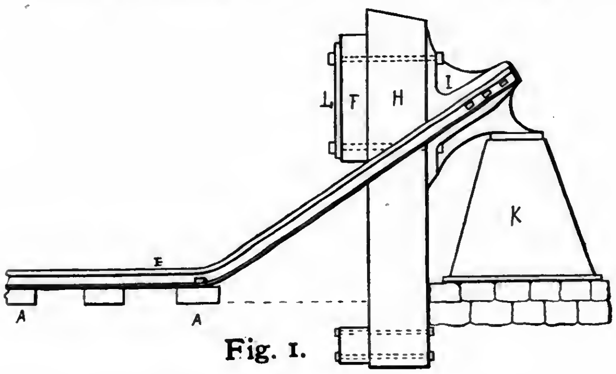


Fig. 1.

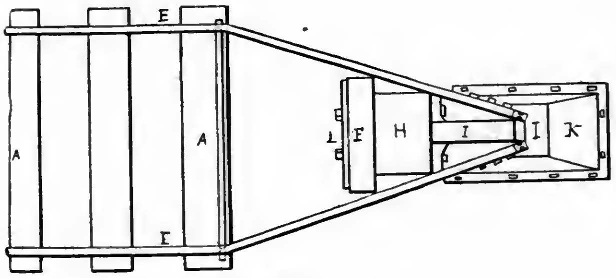


Fig. 2.

ELLIS' RAILWAY BUMPING-POST.

shield faced with iron L, bolted to the post, as shown, and adapted to receive the impact of a car-bumper. I is an iron casting or wooden projection secured to the rear of the post by the bolts which hold the shield F, thereto, and its rear end rests upon the top of a post or column K, set in the ground in the rear of the post H. The ends of the rails E E, are bent inward and upward, as shown in the cuts, and pass on each side of the post H, along the sides of the casting I, and are there secured together by one or more bolts, which pass through the two rails and the casting, as shown in the cuts. The effect is that the post is supported by the track which is held in position by its own weight and the weight of the car or cars upon it, and a very firm and unyielding structure is thus obtained.

This device is claimed to be strong and durable, efficient in its action, and not liable to derangement.

Sypher's Rotary Steam-Valve.

GEORGE W. SYPHER, of Seneca, Kans., is the inventor of an improved rotary steam-valve, which is herewith illustrated and described. It is the object of the inventor to provide a balanced rotary valve that can be readily adjusted to compensate for wear.

In the accompanying cuts, Fig. 1 is a longitudinal section of an engine-cylinder, and cross-section of a valve-case and valve of the improved construction applied thereto, and Fig. 2 a longitudinal section of the valve and case.

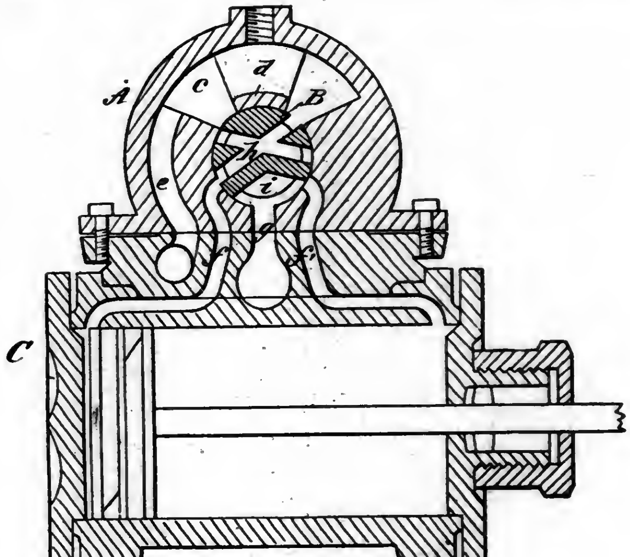


Fig I

SYPHER'S ROTARY STEAM-VALVE.

A is the valve-case, attached upon the engine-cylinder C, and fitted with the rotary valve B. The valve-case is bored out centrally and longitudinally to receive the valve, and is provided with a removable head *b*, at one end, to allow insertion and removal of the valve. In the case above the valve, is a steam-space *c*; and a bridge *d*,

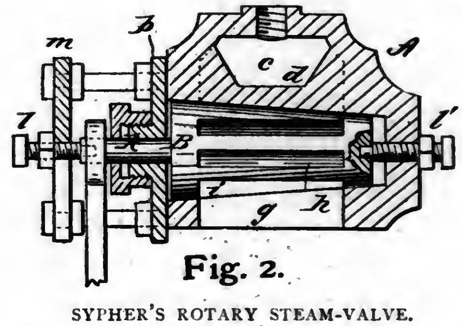


Fig. 2.

SYPHER'S ROTARY STEAM-VALVE.

at the middle of the steam-space, forms a bearing for the upper surface of the valve and a cut-off for the steam. *e* is a passage supplying steam to the space *c*. *f f'* are ports connecting from the valve to the steam-passages of the cylinder, and *g* is the exhaust-port.

The valve is of tapering or conical form, and is ground to its seat in the case. It is made with transverse slots *h*, extending the length of the ports *f f'*, and placed so as to connect these ports with the steam-space *c*. The valve is also made with an exhaust-cavity *i*, on its under side. A stem *k*, is formed or provided upon the large end of the valve, and this stem extends through the head *b*.

To relieve friction and allow endwise adjustment, the

valve is supported at its ends by the pivot-screws l l', the ends of which enter recesses in the ends of the valve; and the screws are made with shoulders that take against the ends of the valve. The screw l, is sustained by a yoke m, the screw l', being tapped through the end of the case. The screw-points and the surfaces of the case against which the valve presses should be made of hardened steel.

At the end of the stem k, on the large end of the valve and around the screw l, is a spiral spring which rests against the yoke and the end of the valve, to keep the valve against the opposite screw l', while the valve is expanding endwise. When the valve is fully expanded it rests against shoulders on both pivot-screws l l'.

The valve can be readily adjusted to compensate for wear by loosening the screw l', and tightening the screw l, and having a continuous bearing at its ends. The wear will be slight and the operation perfect. In case the valve becomes, by wear, too small to fit tightly, a thimble made with slots corresponding to the ports may be inserted in the case and the valve then turned down to fit the thimble.

This form of steam-chest can be used on any air or steam-cylinder by removing the old steam-chest and valve, and placing the one above described on the valve-seat. In casting, both the chest and cylinder can be cast in one piece, if desired.

The inventor claims this device to be ready of adjustment, that the valve is entirely relieved from all pressure, and that a fuel economy of one-quarter is secured. The device is also claimed to give either a stationary or locomotive-engine an increase of power with the same amount of pressure of either air or steam.

McGrew's Railway Ditching-Machine.

ALONZO H. MCGREW, of Hurley, Dakota, is the inventor of railway ditching-machine, which is herewith illustrated and described. The machine is especially adapted to open or trim ditches alongside the tracks of railways to facilitate proper drainage of the tracks, but it is also adapted for use in excavating railway-beds, or for other uses.

In the accompanying cuts, Fig. 1 is a side elevation of the ditching-machine, showing the left-hand scoop at work and the right-hand scoop laid up on the car; Fig. 2 a plan view of the machine with the parts disposed as in Fig. 1, and showing in dotted lines the position of the derrick when the ditching-scoop hangs vertically, nose downward, for discharging its load; Fig. 3 a side elevation showing the positions of the parts just prior to lifting the filled left-hand scoop from the ditch, and showing in dotted lines the scoop laid up on the car, and Fig. 4 a detail sectional plan view of one side portion of the car with the derrick in horizontal section.

A is the floor of a platform-car; B are the longitudinally-ranging side-sills of the car, and C the wheeled trucks of the car, which may have any suitable construction. At D, is shown a cross-beam which is fastened securely to and beneath the opposite sills B, of the car, and projects beyond them sufficiently at each side of the car to form bearings or supports for the lower pivots e, of the posts e^2, of the opposite derricks E, the upper pivots e', of which, have their bearings in the ends of a cross-beam F, which is held directly over the lower cross-beam D, and is made fast to the top beams g, of the frames G, which beams g, are fixed to the posts g', which rise from the sills B, of the car. Blocks d d, may be fastened to the sills B, and to the cross-beam D, near each end of the beam, to give it more substantial support. The post e^2, of each derrick E, is made with a central slot e^3, at the upper end of which, between the opposite side parts of

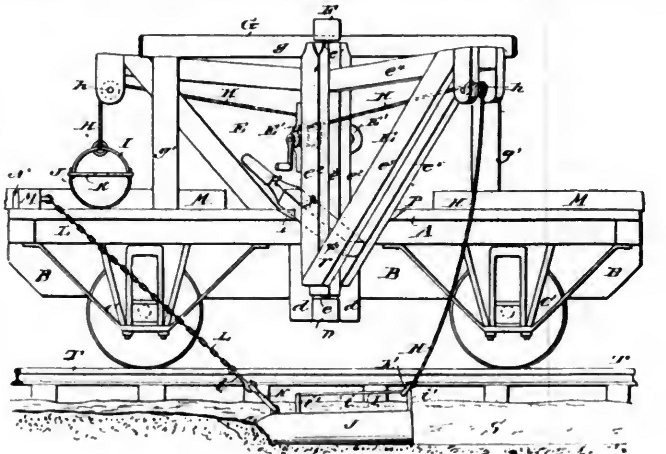


Fig. 1.

MC GREW'S RAILWAY-DITCHING MACHINE.

the post, is fixed the arm or gib e^4, and braces e^5 e^5, connect the outer end of the arm with the lower end of the post e^2.

At the inner face of the post e^2, is attached a suitable windlass or winch E', from which a rope or chain H, passes through the slot e^3, to a sheave or roller h, at the outer end of the arm e^4, whence it hangs to connect by a ring h', with the longitudinally-ranging center-bar i, of a bail I, fixed to the ditching-scoop J, which also has a transversely-ranging forward bail K, with the center eye

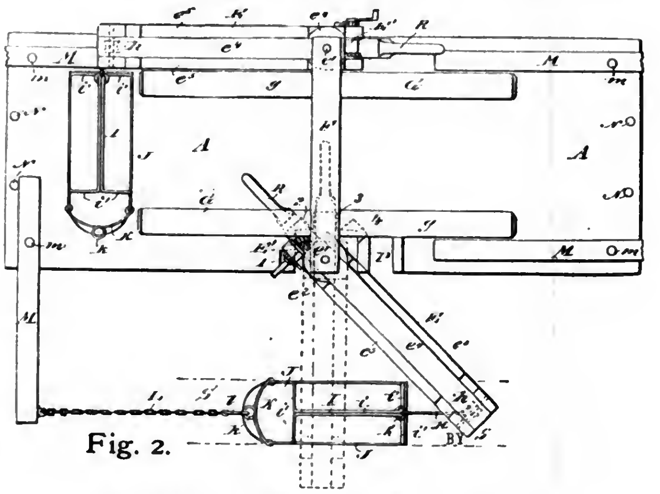


Fig. 2.

MC GREW'S RAILWAY DITCHING-MACHINE.

k, with which the hook l, on the end of a chain L, may be connected; and the other end of the chain L, is connected to the end of a stout arm or draft-beam M, which is pivoted at m, to the platform A; and a stop-pin N, is fixed in the platform so as to limit the swing of the beam M, and hold it about at a right angle with the side of the car when the scoop is at work. The scoop-bail I, is made of a couple of rods or bars, which have end parts i', bent outwardly from their main center portions, which lie close

together and form the bar i, of the bail, the ends of the bars curving downward to connect with the side parts of the body of the scoop, as seen best in Fig. 2. At each side of the car-platform and around the posts e^2, of the opposite derricks E, is formed an opening O, which has a series of notches 1 2 3 4, made in the platform opening into it, as shown in Fig. 4, and at the side of the car-platform near the opening O, is formed an opening P, into which the brace-bars e^5, of the derricks are adapted to enter.

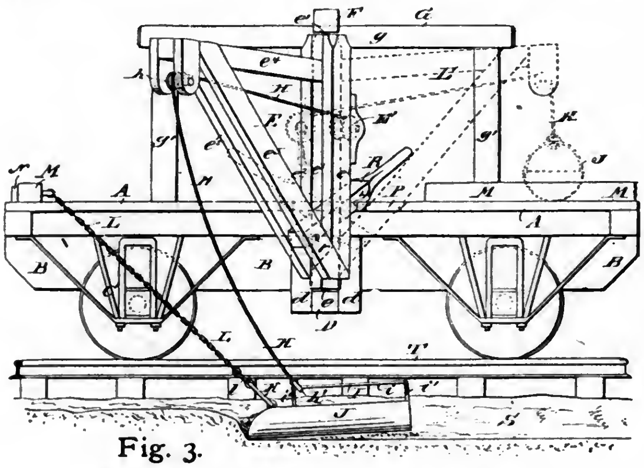


Fig. 3.

MC GREW'S RAILWAY DITCHING-MACHINE.

R is a lever which is pivoted at r, between the brace-bars e^5 e^5, of each derrick, and passes also between the side pieces of the derrick-posts e^2, and is adapted to be set into any one of the notches 1 2 3 4, the inner end of the lever being shaped as a handle by which the lever may be operated from the platform of the car to swing the derrick around. As shown in Figs. 1 and 2, draft-beams M, are provided at each side of both ends of the car to allow the draft-chains L, of two scoops J, one at each side of the car, to be connected with the opposite side beams M, at either end of the car, so that the scoops may be worked while the ditcher is running in either direction to cut or trim, or deepen ditches at both sides of the track T, at once, or at one side only, as desired.

To provide for laying up the scoops J J, one on each end of the ditcher, when out of use, and so as to distribute the weight of the scoops and derricks evenly over the car, the derricks are swung opposite ways toward the sides of the car. For instance, the right-hand derrick will be swung forward toward one end of the car, and the left-hand derrick will be swung rearward toward the opposite end of the car, so that the levers R, of the derricks may be locked into the notches 1, at opposite sides of the car, while the derrick-braces e^5, swing into the notches P, at the other sides of the openings O. This disposal of the derricks compels the notches 1 P, at opposite sides of the car to be reversed in position with relation to the opposite center notches, 3 3, as will readily be understood.

The operation of the machine is as follows: It is supposed that the ditcher is moving along the railway-track T, toward the left hand, and that a ditch S, is to be cut or opened at both sides of the track at once. The draft-bars M M, at the left-hand end of the car are swung outward, and their chains L, will support the front ends or noses of the scoops J, at about the right height when the derricks are held by their levers R, entered in the platform-notches 2, and the ropes or chains H, will be drawn upon by turning the windlasses E′, of the derricks to give the scoops the desired pitch for regulating the depth of their cut. The ditcher will now be drawn or pushed forward until the scoops fill with earth, when the car will be stopped and the levers R, will be shifted from the notches 2, to the notches 4, which will swing the derricks from the position shown at the left-hand side of the car in Figs. 1 and 2, to the position shown in Fig. 3, the ropes H, being slackened a little to permit this movement; and as the derricks swing forward the ring h', connecting the ropes H, with the bails I, will slide from the back ends of the bars i, of the bails I, to the forward ends of the bars, so that when the ropes H, are wound upon their windlasses E′, to lift the scoops from the ditches, the scoops will hang nose upward to prevent the earth from falling back into the ditches, and when the earth is to be discharged from the scoops at the desired place or into chutes, which will carry the earth to one side of the ditches, the levers R, will be lifted from the notches 4, and be swung over and set again into the notches 2, which, in connection with the pull of the draft-chains L, on the scoops, will slide the rings h, of the ropes H, to the back ends of the bail-rods i, and the scoops then will hang from the chains L, and ropes H, with their noses inclined downward, to allow the earth to slide from the scoops; and should the earth stick to the scoops, the levers R, will be lifted from the notches 2, and will be set into the notches 3, as shown in dotted lines in Fig. 2, which will swing the derricks around to slacken the draft-chains L, sufficiently to allow the scoops to hang nose downward in about a vertical position, to insure the discharge of the earth from the scoops. The levers R, may now be set into the notches 2, and the empty scoops be lowered for another load, the car being drawn or pushed forward to continue the work, in the manner above described.

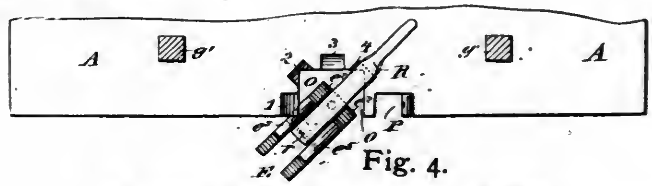


Fig. 4.

MC GREW'S RAILWAY DITCHING-MACHINE.

When the work is finished the ropes or chains H, will be slackened, and the derrick-levers R, will be set into the notches 4, the draft-chains L, will be unhooked from the scoops, and the windlasses will be operated to raise the scoops above the level of the car-platform, whereupon the levers R, will be set into the notches 1, which will carry the derrick-braces e^5, into their respective notches P, at the sides of the car, and lock the derricks against swinging outward, and at the same time swing the scoops one on each end of the car; and the pins N, being removed, the draft-beams and chains M L, will be swung inward on the pivots m, on the car, and the machine is ready for travel over the road.

In working the ditcher in the opposite direction, the draft-chains L, of the scoops will be connected to the beams M, at the other end of the car, and in loading and discharging the scoops, the levers R, will be set into the notches 2 3 4, in reverse order to that above described, as will readily be understood.

By extending the derrick-posts below the platform of

the car, the derricks may be made sufficiently large for the work without extending more than six feet, or thereabouts, above the car-floor, which prevents top-heaviness or instability of the car, allowing it to be run over the road with safety at a high rate of speed. It is evident that the ditching-machine may be constructed with a derrick and scoop at one side only for particular uses in special localities.

The machine is now entirely controlled by Messrs. Mathews & Scobey, of Brookings, Dakota, who are the sole agents for the United States and Canada.

Roberts' Railway Water-Tank.

Albert Roberts, of Marion, Iowa, is the inventor of an improved water-tank for railway service, which is herewith illustrated and described. The tank is especially designed to supply water to locomotives, and the object of the invention is to render the opening and closing of the outlet-valve more reliable, and to prevent the freezing up of the pipes and operative parts during cold weather. This tank is further designed to prevent injury to railway employés in operating it, which is a frequent occurrence with tanks that are operated by chains, pulleys, weights, etc., through the parts wearing out and falling upon the employés from overhead.

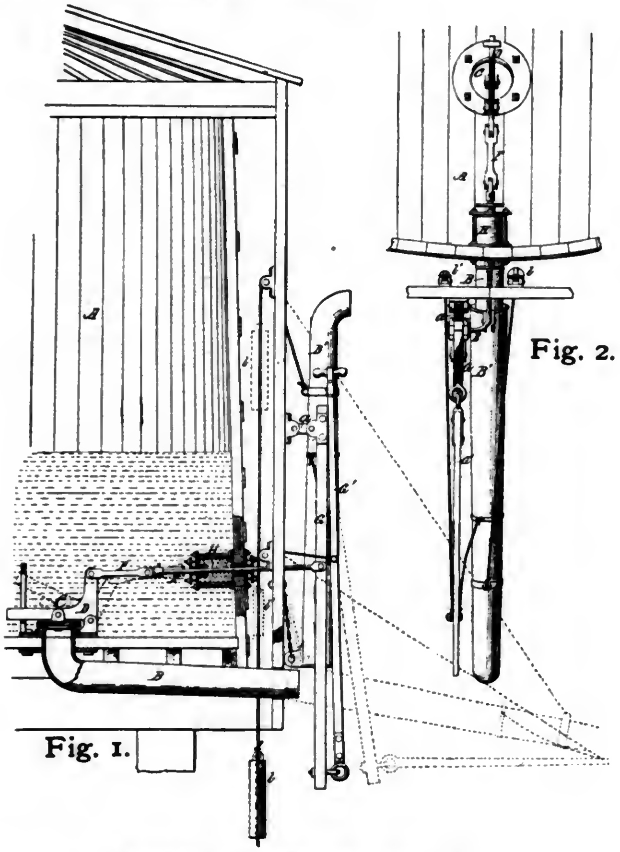


Fig. 1. Fig. 2.

ROBERTS' RAILWAY WATER-TANK.

In the accompanying cuts, Fig. 1 is a vertical sectional view of the improved tank; Fig. 2 a plan view, and Fig. 3 a view showing the tank and its operation in supplying water to a locomotive.

The tank A, is not unlike those in ordinary use, the invention being applicable to any water-tank. In the bottom is fitted an escape-pipe B, turning outwardly, and adapted to connect with the swinging pipe B′, in the usual manner. Over the opening in the bottom of the tank is a valve or gate C, adapted to lift on a lateral pivot by means of a bell-crank D, the valve being attached to the horizontal arm thereof. A rod E, connects with the vertical arm of the bell-crank by means of a suitable connecting-rod F, and passing through the side of the tank is moved back and forth by the pivoted lever G. To bring this lever within reach of the operator from the locomotive-tender, it is provided with a hinged bar G′, adapted to swing up or down with the movement of the

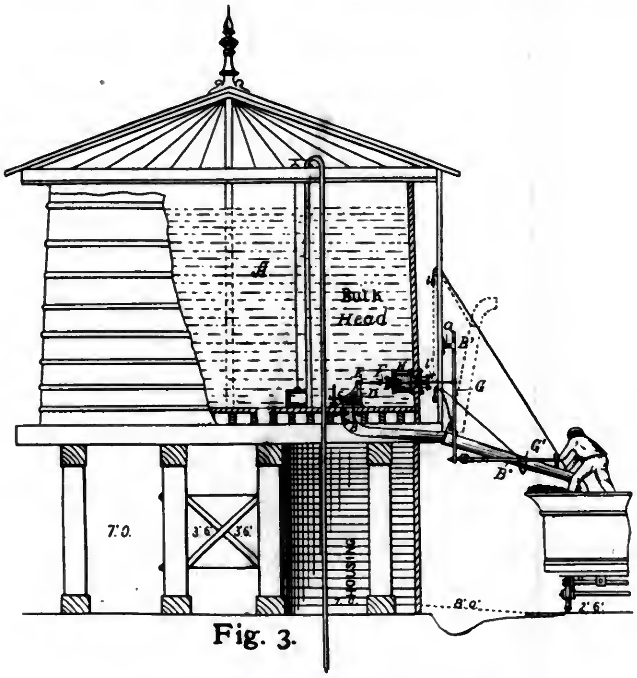


Fig. 3.

ROBERTS' RAILWAY WATER-TANK.

sway-spout B′. As will be seen, the lever G, is pivoted to an external timber of the tank above the valve-rod. A short connecting-rod *a*, permits the necessary variation in position as the valve is drawn out on a horizontal line. The lower end of the lever extends some distance below the outlet-pipe, so that when the sway-spout is lowered to the position indicated by the dotted lines it is about level with the end of the spout, and the handle-bar, pivoted to the lower end of the lever, is horizontal, rendering the operation of the lever and its connections easy and convenient. Another result is also secured by reason of the vertical difference between the pivotal points of the sway-spout and the handle-lever. The spout and the lever may be connected by a cord or chain, as shown. When the spout is elevated, the chain is drawn taut and the handle-lever is thereby held in a vertical position; but when lowered and in its normal position, the chain is slack, allowing the handle to be drawn outward, as indicated.

It will be seen that this construction admits of the valve being forcibly closed as well as opened. Ordinarily the valve is opened by means of a chain or cord passing over a pulley or pulleys at the top tank, and consequently the valve closes by gravity; but by reason of obstructions to the free movement of the chain, or otherwise, the valve is apt to close imperfectly and tardily, causing annoyance and loss of time. It is desirable, therefore, so to construct the apparatus that the operator may control the closing as well as the opening of the valve. To render the movement of the sway-spout and the handle-bar as

easy as possible, and to hold them at any desired angle, they may be provided with counterbalance-weights *b b'*, as represented.

One of the greatest difficulties met with in connection with the ordinary railway-tank is that occasioned by ice. Naturally the ice accumulates on the surface of the water and also around the sides of the tank. The cord or chain which raises the valve is thus continually exposed to the liability of being frozen fast and the tank rendered useless until temporarily relieved by cutting the ice away. This invention is designed to obviate this difficulty by passing the rod which actuates the valve through a non-freezing medium at that place which otherwise would be exposed to ice. To this end a chamber H, provided with suitable stuffing-boxes and glands, is attached to the inside of the tank near the bottom, and through this chamber or cylinder the valve-rod passes. The cylinder is made long enough to extend inward beyond the limits of frost, and, for better non-conduction, is preferably made of wood. In practice, this chamber is filled with common black oil, which will not congeal and serves to lubricate the valve-rod, and thereby the better prevent any accumulation of ice on the parts thereof extending beyond the stuffing-boxes. Obviously alcoholic spirits may be used instead of oil, but this is more expensive and not so good a lubricant. It may be possible, also, to dispense with every kind of a liquid medium here without any important modification of the device, the dead-air space in the chamber being a sufficient non-couductor. The chamber is quite simple in construction, and may be fully understood from the drawings without any further description.

The valve-rod being in the same vertical line with the outlet-pipe, provision must be made for the movement of the sway-spout and the lever at the side thereof connecting with the piston. This may be done by turning the outer end of the outlet-pipe to one side, or, what is equivalent, setting the valve-rod and chamber at an angle to the pipe; but in practice it is preferable to make an offset in the outer end of the valve-rod, as shown in Fig. 2, leaving all the parts and allowing for all the movements in parallel lines.

Gould's Combined Railway Track-Support and Traction-Cable and Electric-Conductors Conduits.

John H. Gould, of Philadelphia, Pa., is the inventor of a combined railway track-support and traction-cable and electric-conductors conduit, which is herewith illustrated and described. The invention is designed to provide a structure which will form a support or bed for railway and street-railway tracks, and also conduits for a traction-cable and for electric-conductors, respectively, and it consists of two parallel tubes united by cross-pieces, one of these tubes being slotted longitudinally and forming a conduit for a traction-cable, the other tube having a man-hole in its outer side and forming a conduit for electric-conductors, the two tubes together forming the support for rails fastened thereto or formed intregal therewith.

In the accompanying cuts, Fig. 1 is a vertical section of the device; Fig. 2 a side elevation, and Fig. 3 a plan view.

A and B represent, respectively, two tubes of metal which are held parallel and infixed relation to each other by cross-pieces C C. These cross-pieces may be bolted or otherwise fastened to the tubes, or be formed integral therewith. The tube A, is slotted longitudinally on its upper side, as shown at *a*, for the passage of a gripping-lever to engage with a traction-cable running on pulleys *a'*, in the tube. The tube B, has a man-hole *b*, in its outer side to permit access to the conductors therein, and the tube may be divided horizontally into compartments *b'*

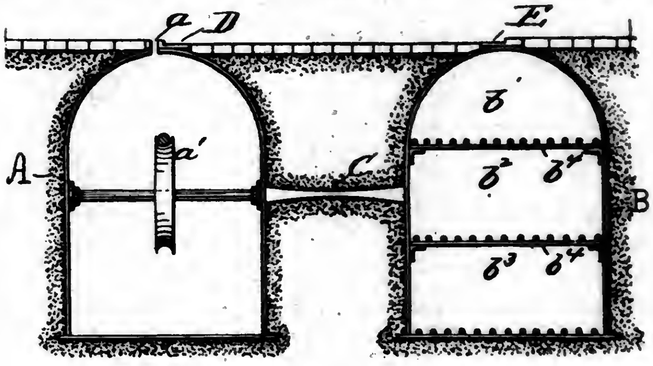


Fig. 1.

GOULD'S COMBINED RAILWAY TRACK-SUPPORT AND TRACTION-CABLE AND ELECTRIC-CONDUCTORS CONDUITS.

b^2 b^3, by means of shelves b^4, for the reception and separation of different classes of electric-conductors—viz., telephone, telegraph, and electric-light wires. The man-hole *b*, will be large enough to afford access through it to the several compartments in the tube B.

D and E represent railway-rails, which may be formed integral with the tubes A B, or be fastened thereto. The

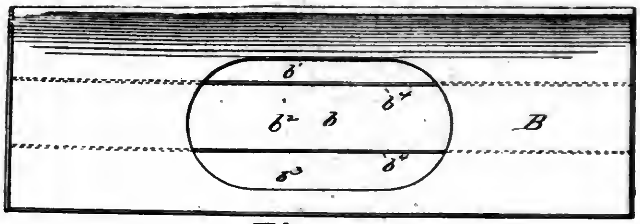


Fig. 2.

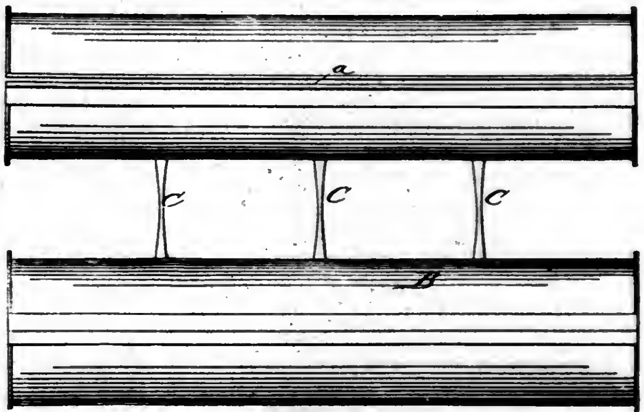


Fig. 3.

GOULD'S COMBINED RAILWAY TRACK-SUPPORT AND TRACTION-CABLE AND ELECTRIC-CONDUCTORS CONDUITS,

rail D is arranged in such relation to the slot *a*, that the tread of the car-wheel running on the rail will cover the slot.

In laying the structure which constitutes the invention, the ground will be excavated in two parallel channels to receive the conduits, leaving a ridge between on which the cross-pieces C C, will rest. The tubes A B, which are

formed in sections of suitable or convenient length, are then laid in the excavation and the sections fastened end to end, or jointed together in any suitable manner, as by bolting. The earth is then filled in over the cross-pieces and around the tubes and the paving laid, the tops of the tubes being on a level with the paving. As the tubes are fastened together by the cross-pieces they will not spread apart, and as these tubes form conduits and the supports for the rails, the one tearing up of a street is sufficient for laying a railway-track, traction-cable, and electric-conductors conduits.

The device is applicable to horse-railways and all other railways, including electric roads, and the tubes are designed for telephone, telegraph, and electric cable conduits. These tubes may also be used for a variety of useful purposes, such as steam-heating, pneumatic tubes, natural gas tubes, etc. A conspicuous advantage derived from the use of the device is that the necessity of repeated tearing up of the streets is obviated, while the employment of timber is entirely avoided, and that several sections may be placed in position without interfering in any way with the operation of the railway. The device is strong and durable, and can be put in position at moderate cost.

Mattoon's Fare-Box Register.

FRANK F. MATTOON, of Boston, Mass., is the inventor of a fare-box register for use on street-cars, and for similar uses, which is herewith illustrated and described. The device is intended to receive fares, whether in money or tickets, registering and indicating their reception, and cancelling the tickets. In using the device, the conductor presents the box to the passenger with the dial toward the latter, and the latter deposits his fare in the opening. The conductor then presses a knob, which causes the fare to be indicated on the dial in the presence of the passenger. This pressure of the knob causes the fare to pass into a locked receptacle or safe, and also, in case a ticket is dropped in, cancels the same.

In the accompanying cuts, Fig. 1 is a front elevation of the device; Fig. 2 a top or plan view of the same; Fig. 3 a vertical section on the line x in Fig. 4; Fig. 4 a horizontal section on the line y in Fig. 5; Fig. 5 a vertical section on the line z in Fig. 4; Fig. 6 a detailed sectional view of the device for operating the coin-damper; Fig. 7 a detailed elevation (from the rear) of the mechanism for operating the ticket-canceling device, and Fig. 8 a detail view showing the coin-registering mechanism.

A represents the upper portion of the outer casing provided with a glass window *a*, through which a dial may be read, and A′ is the lower portion of the casing, and constitutes the ultimate receptacle for the coin and tickets comprising the fares received. This receptacle A′, is provided with a door hinged at *a′*, and adapted to be locked by the person in charge of the conductors, and with a suitable handle A″, by means of which it may be carried about or attached to the person or clothing of the conductor.

B is an inner box locked internally at B′, to the floor A‴, in the casing, so that the mechanism, which is contained in this box, cannot be reached save by first unlocking the receptacle A′, and then the lock B′. This box B, is provided with the longitudinal vertical partitions *b b′*, the latter forming a chamber for the indicating mechanism, the transverse partition *c*, forming a part of the ticket-tube C, and the transverse partition *d*, forming a part of the coin-tube D.

Fares, in the shape of tickets, are dropped into the opening C′, leading to the tube C, and fall upon the damper or valve E, pivoted at E′, to the horizontal partition B″. In its normal position the damper E, is closed, as in Fig. 5, and it is of sufficient length to allow a ticket to lie flat upon it. On the same shaft with the damper is fixed the pinion *e*, which meshes in a rack *f*, carried by an arm *f′*, extending from the vertical rack *g*, rigidly secured to the vertically-moving push-rod F, provided with the cap or knob F′. The push-rod F, is held up in its normal position by the spiral spring *h*, which lies be-

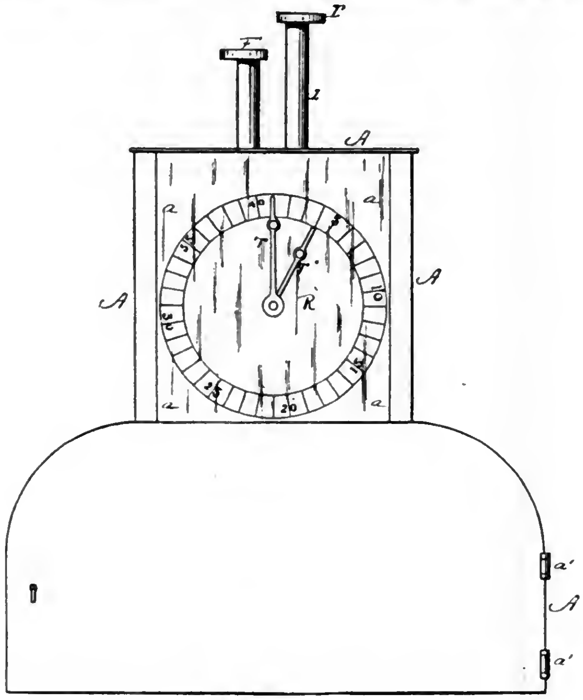


Fig. 1.

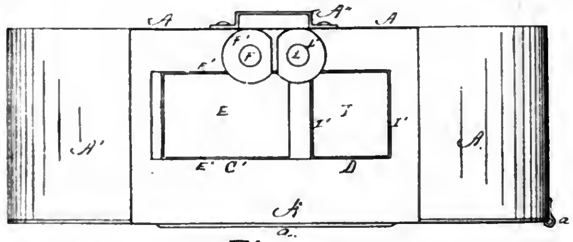


Fig. 2.

MATTOON'S FARE-BOX REGISTER.

tween the pin *h′*, and the depressed floor *h″*. The rack *g*, meshes in the pinion *g′*, which is loose on the shaft G, and rigidly secured to the same shaft are the disk-wheel G″, and gear or canceling wheel G′. A pawl *i*, pivoted to the wheel G″, lies in the pinion *g′*, preventing it from turning but in one direction, and a similar pawl *j*, is held by a spring *j′*, against the wheel G. A gear or cancelling wheel H, is loosely supported in the tube C, opposite to and meshing into the wheel G′. When a ticket has been dropped into the opening C′, and has fallen upon the damper E, as above mentioned, it is the duty of the conductor to press down the push-rod F. This carries down with it the rack *f*, turning the pinion *e*, and the damper E, (which is on the same shaft) into the position shown in broken lines in Fig. 5. The ticket is thus dropped into the tube C, between the approaching sides to the cancel-

ling-wheels H G′, which have not moved during the above operation, as the pinion g', has turned loosely on its shaft, allowing the pawl i, to slip over its teeth. As pressure is removed from the push-rod F, and it is forced up by the spring h, the rack g, rising, turns the pinion g', and by means of the pawl i, wheel G″ and shaft G, the cancelling-wheels G′ H, drawing down the ticket between them and cancelling it by means of the teeth. Thus it will be seen that pressing the push-rod drops the ticket into the con-

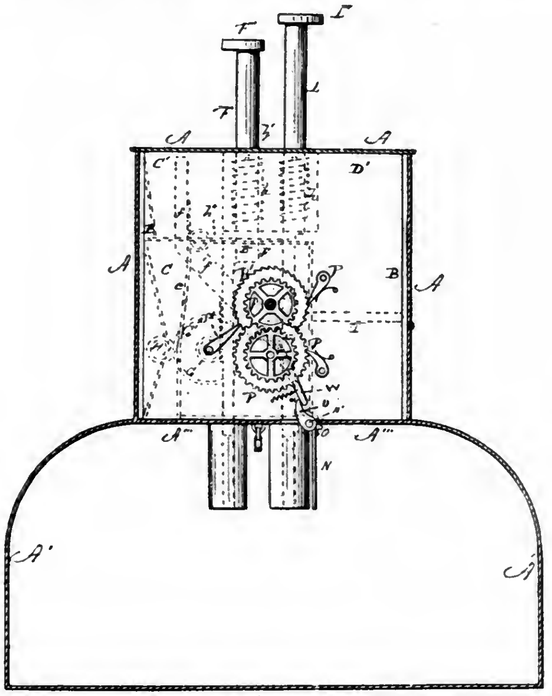


Fig. 3.

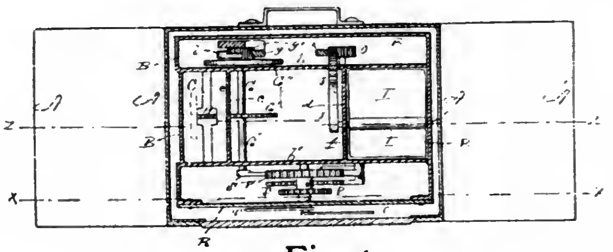


Fig. 4.

MATTOON'S FARE-BOX REGISTER.

ducting-tube C, and releasing it cancels the tickets and drops it into the safe or receptacle A′. Fares in the shape of coin are dropped into the opening D′, leading to the tube D, and fall upon the damper or valve I, pivoted at I′, to the partition d, and the box B.

In its normal position the damper I, is closed. A toothed segment b, is rigidly secured to the same shaft with the damper I, and engages with a rack K, extending downward from the push-rod L, surmounted with a knob L′. This push-rod is provided with a spring l, and pin l', in similar manner to the push-rod F. A lower damper N, is hinged at N′, to the side of the tube D, and on its shaft is fixed a pinion O, which engages with the rack K, in such a position that while the damper I, is closed, the damper N, is open. When the coin has been dropped into the opening D′, upon the damper I, it is the duty of the conductor to press down the push-rod L, which, by means of the rack K, and segment J, opens the damper I, and at the same time, by means of the rack K, and pinion O, closes the damper N, and the coin drops upon it. When the push-rod L, is released, it springs up again and opens the damper N, and closes the damper I, dropping the coin into the receptacle A′.

A suitable registering mechanism P, is provided, and a dial R, connected therewith and showing through the glass a, whereby each fare is recorded and indicated on the dial. When a ticket-fare is deposited, a lever S, rigidly secured to the shaft G, moves the main wheel P′, of the registering mechanism one notch, and registers one on the dial by the hand T, moving one space. When a coin-fare is deposited, a lever U, rigidly secured to the shaft N′, moves the lever W, which moves the wheel P′,

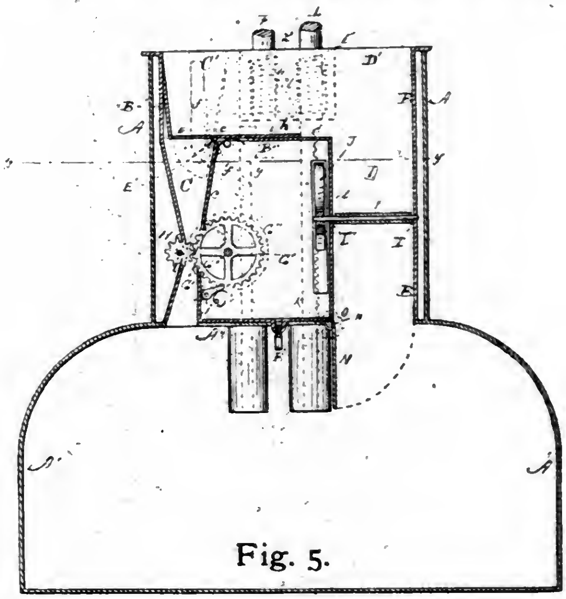


Fig. 5.

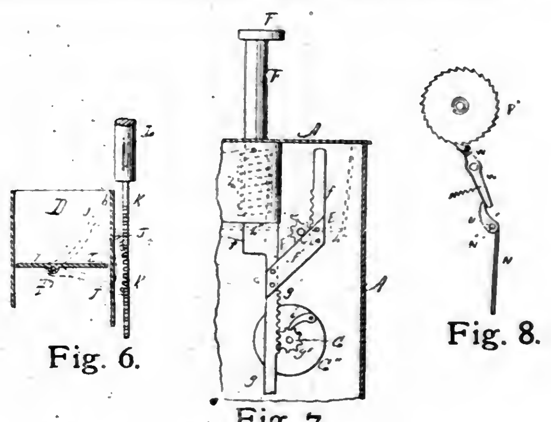


Fig. 6. Fig. 7. Fig. 8.

MATTOON'S FARE-BOX REGISTER.

one notch with similar results. As shown in the cuts, the hand T, is arranged to make a revolution, recording forty fares, while the hand T′, moves one space, thus giving the device a capacity of registering sixteen hundred fares.

It will be seen that even if the conductor should obtain entrance into the safe A′, the indicator would tell the tale of the fares, while if too much coin should accidentally be dropped in, the indicator would be his protection.

Morton's Nut-Lock.

JAMES W. MORTON, of Orange Court House, Va., has recently invented a nut-lock which is herewith illustrated and described. It consists of a thread or its equivalent with which the thread of the nut engages, so arranged as to support the nut when the latter is in position, this

thread being capable of revolving freely upon the bolt to which it is attached, carrying the nut with it, and also capable of being prevented from turning when desired, in order that the nut may be turned independent thereof to change their relative positions.

In the accompanying cuts, Fig. 1 is a central longitudinal section of the device as it appears in its normal position; Fig. 2 a detail view of the blank used to form the peculiar form of bolt necessary, and Fig. 3 a detail of the bolt in its completed form, showing the movable thread in position.

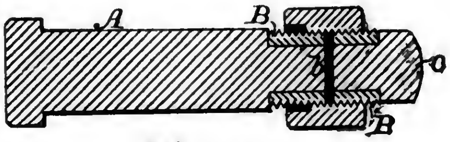


Fig. 1.

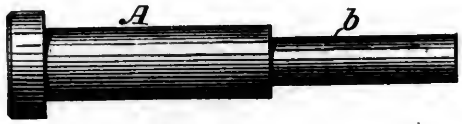


Fig. 2.

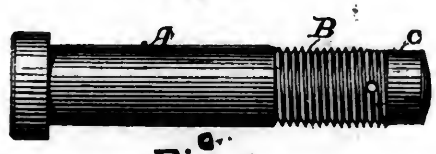


Fig. 3.

MORTON'S NUT-LOCK.

A represents the main portion of the bolt, and B represents the movable sleeve upon which the nut is placed. The blank from which the nut is made is provided with the reduced neck *b*, and upon this neck is placed the sleeve C, which is provided upon its interior surface with screw-threads or other suitable means for retaining the nut in position, as shown. The sleeve is of a diameter to allow it to revolve freely upon the bolt, and it is retained in position thereon by a button *c*, placed upon the end of the bolt, which button may be formed by simply "heading up" the bolt, or may be an independent piece placed upon the bolt and secured by riveting, a screw-thread, or the like. To get the best results in the operation of the device, the space between the interior of the sleeve and the reduced neck of the bolt is supplied with a lubricant, to insure its ready turning when force is exerted tending to produce that result.

In order that the sleeve may be held stationary when it is desired to turn the bolt independent thereof, the neck of the bolt is provided with one or more holes passing through from points diametrically opposite in the circumference thereof, and the sleeve is also provided with correspondingly-arranged holes, so that the holes in the neck and sleeve may be brought to register with each other, and a pin inserted to render the sleeve stationary. The pin used should be of a length to extend through the bolt and a short distance into the shell carrying the thread, but not long enough to project and impede the progress of the nut when being screwed on.

A convenient means limiting the inward movement of the nut is provided by making that part of the bolt adjacent to the sleeve of a diameter slightly greater than that of the sleeve, so that as soon as the thread upon the interior of the nut comes in contact with the bolt its movement in that direction is checked. It frequently happens that by reason of the wear of the parts or other cause it is desirable to screw the nut to bring it further inward toward the object to which it is applied, and therefore the rear part of the nut is formed with an opening adapting it to receive the contiguous portion of the bolt, so that the nut is capable of being carried inwardly a distance equal to the length of this opening.

From the foregoing it will be apparent that when the nut is screwed into its proper position upon the sleeve, and the pin which holds the sleeve in position to receive it is removed, any jarring of the bolt will turn the sleeve, carrying the nut with it, and the latter will not receive any motion independent of the sleeve. Consequently the position of the nut in relation to the body to which it is applied is not changed.

This device is claimed to be simple, durable and efficient.

GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.
Simplicity.
Freedom from breakage.
Certainty of action.
Effectiveness.
Cost of maintaining.
"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

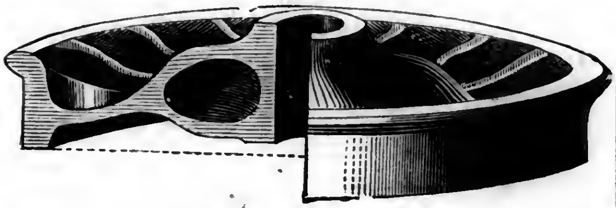
Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,
Per M. D. HARTER, Presiden

Ramapo Wheel and Foundry Company.



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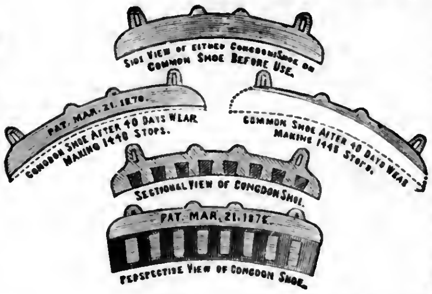
STEEL TIRED and CHILLED IRON WHEELS

For Drawing-Room and Sleeping Coaches, Locomotives, Tenders, Passenger and Freight Cars.

W. W. SNOW, Superintendent and General Manager.

RAMAPO, Rockland Co., N. Y.

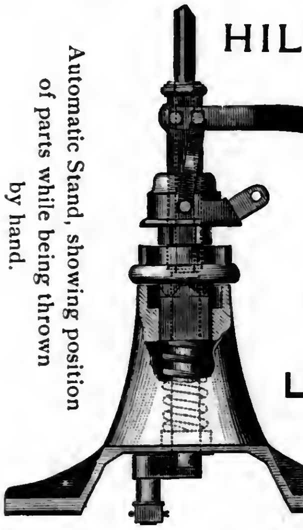
CONGDON BRAKE-SHOE.



This improvement consists of a brake-shoe having imbedded in its body of cast iron, pieces of wrought iron, steel, malleable iron, or other suitable metal, and while being more effective, in that greater uniformity of friction is obtained when applied, exceeds in life, or the duration of the shoe itself, that of the cast-iron shoe by over *seventy-five* per cent. Its extensive use on many of the most prominent roads in the country has proven its economy and superiority over any other shoe in use. All communications should be addressed to

THE CONGDON BRAKE-SHOE CO., 246 Clark St., Chicago
or, RAMAPO WHEEL AND FOUNDRY CO., Ramapo, N.Y.

RAMAPO IRON WORKS



Automatic Stand, showing position of parts while being thrown by hand.

HILLBURN (Rockland County), NEW YORK.

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Switches, Automatic Safety Switch Stands,

YOKED FROGS,

SPRING RAIL FROGS; also, BOLTED AND PLATE FROGS, CROSSINGS OF EVERY DESCRIPTION,

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Automatic Stand, showing position of parts while being thrown Automatically by Train.

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THE ONLY LINE RUNNING

THROUGH CARS

Between New-York, Great Barrington, Stockbridge, Lenox and Pittsfield—the far-famed resorts of the

BERKSHIRE HILLS

of Western Massachusetts—"Remarkable for pure air, romantic drives, and grand mountain scenery. Nature has truly expressed herself in wondrous beauty in the scenery of this region, containing perhaps, more of genuine enchantment than any other in New England."

Five through trains daily between New-York City and all points on the Housatonic Railroad, from the Grand Central Depot via New-York, New-Haven and Hartford Railroad, at 8 A. M. (Passenger), and 9 A. M. (Mixed); 3.40 P. M. (Limited Express with through drawing-room cars), 3.40 P. M. (Passenger), and 4 P. M. (Mixed). Sunday Passenger-train leaves New-York at 6 A. M.

Descriptive Guide Book sent free by mail upon application to the General Ticket Agent.

H. D. AVERILL, Gen'l Ticket Agent.
W. H. YEOMANS, Superintendent.

General Offices, Bridgeport, Conn., July 13th, 1885.

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Steamboat train leaves Boston 6.30 P.M., arrives at New London at 10.15 P. M., connecting with the new steamer CITY OF WORCESTER, Mondays, Wednesdays and Fridays, and CITY OF NEW YORK, Tuesdays, Thursdays and Saturdays. Returning, steamer leaves Pier 40, North River, New York, at 4.30 P.M., connecting at New London with train leaving at 4.05 A.M., arriving in Boston at 7.50 A.M. Good night's rest on the boat.

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Sheet, Roll and Platers' Brass.

MILLS AT WATERBURY, CONN.

American Railroad Journal.

WHOLE NO. 2,569.] NEW YORK, OCTOBER, 1885. [VOLUME LIX.—No. 7.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,

SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

I. THE PACIFIC RAILWAYS.

THE above general subject in its application to foreign countries was brought to a conclusion in the AMERICAN RAILROAD JOURNAL for April, 1884, but circumstances have prevented its continuance for the railways of our own country until the present time.

The want of uniformity in the medical service of American roads indicates that the plans existing on various routes have grown out of the necessities of the situation and have not been provided to meet anticipated wants. Varying circumstances have produced great diversities in plan and mode of organization, and no two are precisely alike. The first lines in the country were constructed through dense populations, where medical relief could readily be obtained in case of accident, and on many of these the original practice still holds of running for the nearest doctor when one is wanted. If the company can be held to a legal responsibility, it has to pay the best fees that can be exacted; otherwise the doctor has the experience for his reward. On the whole, this absence of plan is rather expensive to the company, unsatisfactory to the patient and too harzardous for the doctor to answer such calls cheerfully; but human nature trusts to luck, or to divine providence, when the chances are not overwhelmingly adverse, and so the old way still holds its ground in the east. When railways were pushed far into the uninhabited tracts of the west, the subject of medical relief in accident or sickness was not questionable at all: there were no chances to gamble on, and the company was compelled to make provision.

For many years the merchant marine of our country has had a medical service, which was long maintained by a tax of forty cents per month upon all who manned the craft carrying the American flag, both upon the sea and the inland waters. This tax was subsequently increased to fifty cents per month. Hospital buildings have been erected from government appropriations, but the tax has been found sufficient to meet current expenses. This system furnished a convenient model for the first railway medical service instituted on the lines built to the Pacific. In 1869 the Central Pacific company instituted a medical service on the above plan and built a hospital at Sacramento, Cal., with accommodations for 125 patients, at a cost to the company of $64,000. The tax of fifty cents per month is exacted from all employés, and is found sufficient to meet the running expenses. All employés of the company are entitled to treatment at this hospital for a period equal to the length of time they have contributed to the hospital fund, provided the ailment be not due to "veneral infection, intemperance, bad habits, vicious acts, hereditary, constitutional or previous infirmity." In addition to this, "physicians are under engagement with the company, on the different divisions, to attend to the wounded in case of accidents."

In 1882 the Union Pacific company adopted a similar plan and determined to establish a general hospital at Omaha, with subordinate hospitals at Denver and Ogden. Up to 1883, however, only the hospital at Denver had been erected, and at that time the assessments were confined to the lines in Kansas and Colorado. Local hospitals are used at other points in cases where the company assumes the expense of treatment. The whole service is in charge of one chief surgeon, who appoints assistants at suitable points, subject to the approval of the general manager. Salaries are paid at the most important points to these medical officers; at others they receive a free pass as compensation.

Applicants for treatment on this plan must present orders from a foreman or superior officer, and at conclusion of the cases are presented with certificates of discharge to be handed to the foreman on returning to work. Those affected with ailments of moderate severity are treated as out-patients. Medicines are furnished to both classes of patients.

The Galveston, Harrisburg and San Antonio Railway system had a medical service previous to its absorption by the Southern Pacific system, and a hospital at Columbus, Texas. This service extends from El Paso to Lafayette, La., 1,240 miles, administered by a medical director, a house surgeon and an assistant at the hospital, together with a number of local surgeons at intervals along the entire line. It is the duty of the latter to make temporary dressings and prescriptions, and forward patients to the hospital at Columbus. The expenses are met, as on the Central and Union Pacific railways, by an assessment of fifty cents per month upon the wages of all employés. The hospital report for 1883 is before me, which shows a total number of 1,166 patients treated, of whom all but 17 were discharged and returned to duty.

The relief provisions of the foregoing companies do not extend to the families of employés, and in all cases are limited to injuries and diseases contracted in the line of duty; but independent associations for this object exits among the employés of the Central and Southern Pacific systems. Dr. Harrison, medical director of the hospital at Columbus, Texas, alone reports attention to the personal hygiene of employés and to the sanitary condition of railway-cars, buildings, grounds, etc.

No examination has so far been made of employés to

test their general soundness of health, or the integrity of their organs of sight and hearing.

It is obvious that the hospital system of these companies was wisely contrived, that it is ably administered, that it contributes immensely to the welfare of their employés, and that the latter appreciate its benefits, which are felt in a degree far above the trivial cost per capita.

IRON CARS.

BY A MASTER CAR-BUILDER.

[Written for the AMERICAN RAILROAD JOURNAL.]

FOR the past few years the subject of metallic or iron railway-cars has been agitated, but so far with no permanent results. The most probable reason for this is that lumber has not reached a price sufficiently high, nor iron or steel a price sufficiently low, to make the change of any great importance from a commercial standpoint. Added to this is the fact that the building of iron cars involves a knowledge of construction, etc., in which our car-builders are not versed, inasmuch as the difference in the kind of knowledge required is as great as the difference between the two materials—wood and iron, or wood and steel.

It has been said that outside influences are at work for and against the change—that of the lumber dealer to retain the present practice and that of the iron manufacturer to change it. It is not probable that either of these interests have any material weight, because all roads will look to their own interests in preference to either those of lumber or iron dealers, and this phase of the matter may therefore be dropped as having no material weight influencing a change, or no change.

The change, if it occurs, will be gradual. Already all-iron trucks for freight-service are gaining ground, and iron bolsters and also iron brake-beams for passenger-cars and locomotive-tenders have found favor as being lighter and more servicable than wood. Thus, piece by piece, the change will occur.

That the average car-builder is lacking in the necessary knowledge to make substitutions of iron for wood, scientifically and correctly, is demonstrated by the fact that the changes which have taken place have, in many cases, resulted in an unnecessary weight of iron, not well handled to fill the purpose intended. Iron is on an average thirteen times stronger than white oak, while it is less than seven times heavier, bulk and strength being considered. It is frequently found that a pair of wrought-iron bolsters are capable of carrying over 100 tons, and weigh from 500 to 600 pounds, thus being much heavier than wooden bolsters and unnecessarily strong. An iron bolster, correctly designed, should not weigh over one-half as much as an oak bolster of equal strength, and it would appear that to design iron cars correctly the designer must be possessed not only of a knowledge of car-building, but also, to a great extent, of iron bridge-building, which iron cars will greatly resemble in the methods and formulas required in their design.

It is claimed that iron cars would be free from the danger of fire. This would, undoubtedly, be true of an all-iron freight-car, but in passenger-cars this advantage would disappear to a great extent, as the linings, furnishings, etc., inside of the car would undoubtedly be of wood, and it is questionable if passenger-car bodies will ever be built of iron, as they would probably be very hot in summer and very cold in winter, to which would be added the intensifying of the noises occuring in a moving car, due to the better sounding-board qualities of iron. At best the substitution of iron and steel in passenger-cars will hardly pass the sills and possibly the framing of the body.

A master car-builder some time since in referring to freight-cars gave his views of the matter as follows: "Considering the car as a bridge, and remembering that as long, or within reasonable limits, as I am not obstructed in my choice of depth of truss, the more I increase my depth of truss the more material I can save, there is no reason why I cannot make the car, instead of trussing under the frame, one truss of 6 feet 5 inches depth. Now I have increased my depth of truss nearly seven times, and of course I shall abandon at once every stick of timber there is in the frame and change it into iron. I should suggest to make the outside sills of steel, the bottom chord of the truss, and this bottom chord has to carry the floor system and the load; that is I have got a bridge where the load is on the bottom chord. I have got a bridge, itself as a pivot, with 19 feet 4 inches in the clear. The top chord I propose to utilize the same way as is the plate in the wooden car. Intermediate timbers I propose to do away with altogether. I have got here a distance of 19 feet 4 inches in the clear, or in other words, from abutment to abutment I take the height of my car to be 7 feet, and I utilize from bottom chord to top chord. I ought to make this 6 feet 5 inches as the height of the truss from center to center of chord. The truss is divided into three square panels of 6 feet 5 inches each, and here is my first portion of the truss. Now I have to take care of the end parts. The end parts may be regarded in the light of a beam supported at one end uniformly loaded, or the whole truss may be considered in the light of a continuous girder, with the intermediate supports 4 feet 10 inches from the end. I have now to provide here for my door-post. I have also to provide for a strain here on the end and for the counterbraces, or for the greatest stability of my end post by a third brace. Here is the side frame of the car. The center panel is without any bracing so as to leave it free for the door opening. The whole truss or side of the car I should propose to make a riveted truss, using channel-bars for top and bottom chords, and flat beams, and "I" beams and angles for centers. Let this represent the horizontal projection of the lower chords. For the end-sills I propose again to use channel-bars and to face these channel-bars with timber, this timber to be bolted on and through onto the chords. There are no intermediate floor-beams and there are only two center floor-beams. Now in regard to the floor system, I propose to use "I" beams, taking the inside length of the car to be 28 feet in the clear. I propose to use as in my floor-system three-inch "I" beams—the very lightest kind of "I" beams—and on top of these beams, with the outside channels 7½ inches high, I propose to lay down longitudinal floor-stringers of yellow pine, 2 x 5 inches, and exactly one foot apart from inside to inside. Eight of these floor-beams run now from end to end, supported by "I" beams. Underneath and on these I cans pike the ordinary 1¾-inch floor which is used in the box-cars."

While this covers the general plan, it does not go into the most difficult portion—the details of fastenings, which

really require much more attention than the general plan, as the above consideration is largely in the light of a mere bridge, without being subjected to the concusssions, twists and strains to which a car is, and which therefore would be the weakest point and the first to give out.

Something like twenty-five years ago the New York Central road built several iron freight-cars, which are still in use. If a copy of the cost of keeping these iron cars in repair could be obtained and compared with the following, which is a copy of the cost per mile for maintaining wooden freight-cars, considerable light would be thrown on a very important point; viz., cost of repairs of iron cars as compared with wooden cars:

	Cost per Mile.
Labor	$0.1726
Lumber	0.0529
Wheels	0.1179
Axles	0.0261
Bearings	0.0618
Wrought-iron	0.0513
Cast-iron	0.0310
Draw-heads	0.0103
Springs	0.0169
Roofs	0.0061
Paint	0.0077
Sundries	0.0163
Total	$0.5709

The cost for repairs to iron-freight-cars will probably be much more than is usually believed, if the item of repairing wrecked cars is taken into consideration. When two freight-trains run together it is generally found, if they have been running twelve or fifteen miles per hour, that the tender frames, if of iron, and the tanks are frequently so bent and distorted that it costs more to repair them than to build new ones. We have here a fair comparison with the result that might be expected to follow if the cars were of iron also. The reason for this is the difficulty in straightening out iron frame-work, and especially the thin iron sides of the tank. To straighten them it is necessary to cut off all of the rivets, and the frames must be heated and straightened, which results in "oblonging" the rivet-holes. Then it will be found that the frame is lengthened a little here or there—just enough to cause the rivet-holes to be "blind" considerably, which necesitates their being reamed out and larger nuts used.

The life of an iron car would, undoubtedly, be longer than that of a wooden car, *if it met with no serious accident*, in which event it would in many cases be cheaper to allow it to end its life right there than to attempt to repair it. It would also be necessary to keep iron cars well painted else their destruction would be very rapid, In fact they would require the same attention in this respect that an iron bridge does, while a wooden structure might be left without paint for years with not one-tenth the decay of the iron structure similarly neglected.

The mode of repairs to iron cars will be entirely different. If we suppose that an overhanging load of lumber has punched a hole in the end of a wooden box-car, the repairing of it is a very simple matter of a few hours for one man. If the car be an iron car the repairs assume a very different aspect. The bent sheets must be straightened, which means several hours of pounding with a couple of men inside the car and a couple outside, and much of the torn and jagged ends of the hole must be cut away. A row of rivet-holes must then be made to secure a patch to. How are these holes to be made cheaply and quickly? In many cases a portable or hand-punch could not be used and some kind of a portable drill would be required, and thus the repairs of iron freight-cars would require the displacement of wood workmen and the employment of iron workers, with special tools and more time to be consumed, to replace the cheaper class of labor with simpler tools. It is questionable if any one now living will see an absolute change to all-iron cars in universal use.

LUBRICATING ON RAILWAYS

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

NOTWITHSTANDING the efforts made by scientists and practical observers to diffuse a more thorough appreciation of the important subject of lubricating, and thus encourage more careful selecting and purchasing of lubricants and attention to their proper application, a very large number of manufacturing concerns, and railways especially, are slow to give attention to this important subject so vital to their interests, and which so seriously concerns the safety of the traveling public, their employés and their own property. They remain blind or contemptously ignore the cause of the rapid wear on the machinery, cost of repairs, delays, danger, and waste of power and fuel.

Men who would not delay one moment in giving their personal attention to any shortcomings in the value or quality of materials used for manufacturing in their establishments, and would not fail instantly to notice and severely reprimand their employés for wasting or wrongfully using such material, are often indifferent to the important factor of lubricating without which their establishment would be at a standstill, and railroading only a thing of the imagination.

This is no idle fancy, and the facts are verified by many establishments where the dilapidated and unclean appearance of the squeaking engine, shafting, and general machinery, stands in sorry contrast to the exemplary order and condition of all other contrivances in the place; and nothing is needed to demonstrate these facts to railways other than the many "hot-boxes," causing delays and danger to the traveling public. In blissful ignorance as to the cause and possible consequences, travelers become at times alarmed at the stenches, and sometimes flames, arising from underneath coaches and are consolingly told, "only a hot-box!" They little dream while closely nestling in their sumptuous surroundings what great danger underlies these few words. By such overheating the metal of the bearings suffer unequal strain from undue expansion and sudden contraction by being hastily cooled, and apparently unaccountable accidents may result long after and when least expected.

But what is the cause of hot-boxes? No doubt they often occur from causes unforeseen and hardly avoidable, but, in most instances, they may be attributed to the oil, and in reality to the carelessness with which lubricants are selected and purchased, without knowledge of their characteristics and the theories of lubricating, and in entrusting their application to still greater ignorance and less responsibility on the part of inferior employés.

It is not unusual to see train-hands when applying waste and oil to boxes, or while emptying hot ones, deposit their

tools and waste on the dirt and cinders of the road-bed, and after replacing the waste, without thought of the adhering cinders, are perplexed to see the same box shortly become heated again.

However proficiently an engineer or mechanic may have acquired his profession, he is not necessarily expected thereby to be a competent judge as to the quality and efficiency of lubricants. But intelligent and experienced mechanics, who have the using of lubricants on the roads and in the shops, should be consulted and permitted to give their opinion honestly and without fear of incurring disfavor from interested influence; their opinion should be accepted in a like spirit and no absolute purchasing authority should be delegated to others than those truly competent and of known integrity.

The subject of lubricating, at least so far as railways are concerned, is important enough to forbid trifling from ignorance and prejudice, and should much less be a subject for false economy and avarice. It is wrong—nay, it is criminal—to leave the selecting and purchasing of lubricants for railway use to persons not thorough mechanics and competent judges of lubricants and lubricating; but it is still more so when such purchases are dictated by false economy, undue influences, or downright dishonesty. With railways it should not be the question which is the cheapest oil or grease, but which is the most efficient and safest for the work to be done; nor should the lubricating be done through contrivances adopted for their cheapness or some apparent mechanical ingenuity, nor on account of some person's authority and influence. The lubricant should not be selected, changed or condemned to suit such particular contrivances, and it should always be remembered that it is the lubricant and not the lubricator that is to do the lubricating.

Mechanical engineers, capable of conceiving and executing the loftiest plans of engineering and of building ingenious machines, often fail to make adequate provisions to enable lubricating to be done with efficient lubricants, and lay any shortcomings to the latter, when the least forethought and proper appreciation of the subject would have suggested other causes. It never occurred to them while constructing such machinery that the materials used for lubricating possess many different characteristics, and that where limpid ones find easy access through the devices provided, thicker lubricants cannot find their way to the place where their services are required, and very frequently it becomes necessary to use a lubricant limpid and less efficient than the one which should be used for the perfect and uninjurious working of the machinery. Many of the appliances for feeding lubricants are thus devised from limited knowledge as to the characteristics of the lubricants. We cannot make a lubricant perform a particle more work by restraining its free application by mechanical contrivances, as the amount of lubricant needed is in exact proportion to the work to be done by the machinery and a given amount of lubricant can do no more lubricating than the amount of lubricating capacity it possesses will permit.

Most of the so-called cheap car-oils used on the rolling-stock of railways and street-railways are made from "still-bottoms" of refineries. The manufacturer cannot be ignorant of their inefficiency and danger, but succeeds thus in ridding himself of a waste-product otherwise almost valueless. Equally inefficient are car-oils manufactured with additions of resin, resin-soaps, or metallic resinous combinations. These substances give the oils apparent body, but their accumulated resinous deposits are detrimental to lubricating and conducive to increase and accumulation of frictional heat.

The natural oils are imperfect lubricants; they lack body and sufficient consistency, and in hot weather they run off the bearings as fast as they are put on. Some contain too large an amount of the lighter hydro-carbons and emit their dangerous vapors too rapidly under frictional heat, especially in hot weather and in hot places. Others which appear to possess some body are equally unsatisfactorily on account of the grit and impurities they hold in suspension and which are deposited on the bearings when left by the lighter constituents of the oil which vaporize with the absorbed frictional heat. The admixture of animal or vegetable oils diminishes these defects somewhat, but they also thin out when warm and congeal when cold, and however diluted, retain their natural tendency to decompose and form gummy deposits in exact proportion to the amount of their admixture.

Still more inefficient are those oils in which lubricating body is claimed on account of an admixture of plumbago, soapstone, etc. When we consider that these latter are inert substances which cannot vaporize with the frictional heat like their pretended solvents, it is easy to see that they must remain and accumulate on the bearings. Oils and greases with such admixtures of inert matter are injudiciously compounded lubricants when intended for continuous application. Their liquid part, which is the real lubricating power, while vaporizing under the frictional heat, decreases as the accumulation of the inert matter which cannot vaporize increases, and the friction of the latter on the equally inert metal of which the bearings are composed helps to retain and gradually accumulate the frictional heat to such an extent as to cause dragging, serious injury, and finally positive stoppage or breakage, if timely relief and removal of the irritating cause is not resorted to.

Lubricants, to be efficient, should possess a nearly uniform consistency at all temperatures sufficient to permit of a tenaceous hold on the metal and a liberal application without wasteful loss and too rapid evaporation, but not so much as to cause decomposition and formation of deposits.

THE INTERIOR FINISH OF PASSENGER-CARS.

BY T. F. PAGE.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

THE subject which your committee has assigned me, asking for my practical views and experience, namely: "The inside finish of a passenger-car from the foundation up," should be considered a very important one.

Porous hard woods being most in use for this purpose, the need of some substance to fill up the pores to a level with the surrounding surface is felt, and the absorptive nature of the wood demands that it be liberally treated with liquids, or glazed over with something that will prevent varnish from sinking into it, and also into the material with which the pores have been filled. After the wood has been well filled and absorption satisfied, there

seems to remain no difficulty about obtaining a fine finish in any of the usual ways, with varnish, oil-finish or shellac, either left with natural gloss, rubbed down to a dead lustre or polished.

The true principle of finishing wood, it has been claimed, should be to obtain a smooth and level surface with the least possible amount of varnish or other substance which would build up a thickness on it; but it may be desirable in some cases to put a thickness on where much cleaning and scrubbing is to be done. In my own experience I have given the subject considerable thought and have tried much in the way of experiment with the view of doing away with the necessity of rubbing down coats of varnish to get a level surface. There are some difficulties in the way of accomplishing this, some of which I will mention.

The pores being of various shapes and sizes will take in and retain the filling more or less according as their forms may be adapted for it; some are in the form of holes coming end to to the surface, in which case they take and hold the filling very well, while others are long, trough-like and very shoal, where no amount of skill in the use of block, knife or rag can induce it to remain. In wiping off the surplus and cleaning up with a rag in the usual manner, the filling is necessarily lowered a little below the level of the wood, and while drying the liquid portion of the filling is absorbed to a considerable extent by the wood, causing quite a shrinkage, so that by the time it is well dried we find by a close examination that the filling up of these pores has been so far only a partial success, and the grain of the wood has been raised up in places owing to the working in of the liquids between the fibres, necessitating the use of sandpaper which will also remove more of the filling, and we have so far quite an imperfect piece of work.

The nail-holes (owing to their size and form), are still ready to absorb oil from putty, causing a shrinkage very noticeable, and in following up this filling and puttying with a coat of shellac, the alcohol partly dissolves and softens the filling so much that it does not regain its former worth.

I have given several of the advertised ready-mixed and patent fillers a fair trial and have used many different substances and formulas of my own composition, and I am inclined to the opinion that a good filler should be composed of some material which is very soft and pliable, free from grit however fine, not very quick-drying, but when thoroughly dry should be very hard; indeed hard enough to resist the action of a coat of alcoholic shellac, and tough enough to admit of a moderate use of fine sandpaper.

Whatever filling we use and however skillfully manipulated, there still remains one thing which is as indispensable in this branch of car work as in any other, and that is time.

Our superintendents and master mechanics have generally quite a correct idea of the necessity of drying the foundation coats of paints and the varnish, but who of us ever heard of one of these worthies being willing to incumber any part of the shop with a car for the reason that the filling was not yet hard enough to go ahead with the inside? A quick-drying filling containing much japan is no remedy for this, for it will not satisfy the suction of the wood. It is true that such a filling may close up and bridge over most of the pores, but anything which is put on afterward will sink into the wood and also into the dry material of which the filling may be composed.

To some extent the difficulties here mentioned can be overcome when time and expense are allowed, and when these can be had I prefer a filling composed as here given: Equal parts best coach japan and raw oil, mixed to a thick paste with corn starch and as much litharge as can be used without discoloring the wood; thin in spirits of turpentine to a working consistency, and use the same day of mixing.

After filling comes the stopping of nail-holes. Make a putty with whiting, japan, varnish, and just enough oil to prevent crumbling, and color to suit the wood; leave it higher than the face of the wood, and when all is dried hard, use block and sandpaper over the whole surface, cutting down the putty at the same time. On moldings and irregular surfaces leave the putty just flush when put in.

The sandpapering done, proceed to fill all again with filling mixed the same as before. This will be partially absorbed by the wood and will build on to the filling already in the pores, and will contain enough oil to restore the color to the putty, which, after having dried, is light colored and dry in appearance; but after this second filling it cannot be seen if matched to the color of the wood.

To darken light mahogany and cherry, bichromate of potash dissolved in water is excellent, and gives it the appearance of age.

The rubbing down of varnish and the so-called hard oil finish has been done in car work considerably of late years, but does not appear to be much improvement over the same materials as the brush leaves them, certainly none in the matter of durability, and as for looks, a few months' wear reduces them to about the same general appearance.

Four or more coats of shellac rubbed down to a fine finish look very nice when just out from the shop, but soon deaden and look dull and dry, and seem to fail in properly protecting the wood around the doors and windows where frost and moisture have a chance to act.

Close-grained woods, such as cherry and maple, although somewhat porous, can be brought to a fine finish without any filler except to saturate the wood with a mixture of oil, japan and spirits, after which proceed in the same manner as with those woods which had their pores stuffed with filling.

Wood ceilings seem to call for about the same treatment as the sides of the car, although it may be questionable whether a varnish gloss gives the general satisfaction that a dead finish does. As for decorating the ceiling, I know of no prevailing style or tendency to change, except to use less or none at all. Many people consider it unpleasant to have the attention riveted to some example of decorative skill while traveling in a railway-car, and to place that example overhead may increase those feelings to quite a degree of uneasiness. A ceiling composed of handsome grained wood with fluted moldings over the joints, and rosette corners, set off with expensive lamps and bell-cord hangers, is quite tasteful of itself, certainly about as attractive as the sides of the car, where it is never thought necessary to trace any ornament in common first-class passenger-cars.

THE INTERNATIONAL RAILWAY CONGRESS.

Reports of the proceedings of the International Railway Congress, lately held in Belgium, are singularly meager. The congress was apparently a success as far as attendance went, and in the matter of accomplishments it did perhaps as well as an initial meeting could have been expected to do. The range of topics which it had laid out for discussion was very wide. While the discussions do not appear to have been particularly remarkable except in the way of extent, the papers and reports which elicited the discussions were very valuable and interesting, not only as representing opinions of experts, but as recording experiences. In the reports and discussions, mechanical questions seemed to receive the greatest measure of attention, traffic problems and the like being scarcely touched upon. Among the chief topics of discussion were metal sleepers, continuous brakes, the security of passengers, electrical railway appliances, block systems, suburban lines and Sunday rest. The wide field outlined in the prospectus of the congress was imperfectly filled, unless reports are in error, but this is hardly a fault to be urged. A reasonably full discussion of a few topics is far preferable to a meager, ill-considered discussion of many.

Regarding metal sleepers it was reported that their use had as yet been too restricted to enable definite recommendations to be made. The varying conditions of different countries rendered a universal indorsement of metal sleepers unwise. It was stated, for instance, that while in Egypt steel sleepers were impracticable, because of the corroding effects of sand in India, the use of metal sleepers was enforced, because of the attacks of ants upon wooden ties. In our country, we may add, an obstacle to the use of metal ties arises in their cost; we can keep ourselves supplied with wooden ties for the interest upon the investment which metal ties would call for. Despite the irresolution of the section which discussed the use of metal ties, the congress as a whole finally gave formal indorsement of their use upon important stone-ballasted lines.

Continuous brakes were discussed, and the congress urged their more general adoption. There were developed marked differences of opinion as to the desirability of an automatic action. It seems rather odd to us Americans to see the question of an approval of continuous brakes up for discussion, as but one opinion prevails here where they have proven themselves so essential.

Another topic, equally odd to us, was that of providing better means of communication between the passengers and those in charge of the trains. This came up under the head of security to passengers, and the congress formally recommended that such means of communication be provided. It is a wonder that foreign nations have put up with the isolation of their compartment-cars as long as they have, but if the recommendation of the congress finds attention they will learn to be thankful for the summer's conference.

The subject of electricity and its application to railway working received a large measure of attention, as was to be expected. No action was taken by the congress, but the information presented to it was very extended and valuable. In signaling and switching, electricity is growing more and more useful; mechanical, hydraulic, pneumatic and electric power are running races to gain favor for the purposes named, but electricity can never be distanced; for while as a power it may be displaced for certain work, it is always essential as a means of flashing intelligence, and is sure to be employed in combination with other agents for many purposes. Accordingly the congress did well to it give the full attention that it did. The block system was favorably discussed, as was the use of the electric light on cars and in stations, The whole field of electric practice as connected with railways was shown to be well covered and successful employments of the subtle agent were reported without number, but it was conceded that it was too early to prescribe formally any methods of use.

The question of the treatment of suburban lines was discussed at considerable length. In foreign countries these suburban or local lines form a class by themselves and scarcely have counterparts among our roads. Here all seek a common level of traffic. With us the large through lines do not disdain the suburban commuters; on the contrary, they seek them and in fact really carry the great bulk of them. On the other hand the "local road" is a rarity that is not dreaming of or planning for a slice of through traffic. Abroad the distinctions are made, although the bringing of the subject before the congress indicates that the one class trenches upon the other's supposed rights to some extent in freight as well as passenger-traffic. This was one of the few questions upon which the congress formally expressed itself. It concluded that these local, or suburban lines, known as secondary lines, should be distinctly considered as feeders and that they should not be built with a view of attacking the interests of the longer lines, and that they should in return receive full courtesies of traffic exchanges, common platforms, etc., from the through lines.

The question of Sunday rest received earnest consideration. It was early found best to treat the question less as a matter of sanctity than as a matter of rest for employés. The continental habit took rather unkindly to the theory of sin in Sabbath breaking. When viewed in the business light, it was found that railway work can be lessened if determined effort to that end be made. It was shown that the Great Western Railway, of England, had succeeded admirably in reducing Sunday work. In 1884 only 3.70 per cent. of the total passenger-train mileage and 6.03 per cent. of the freight-train mileage of that road was run on Sundays. Accordingly, the Sunday service of the employés was largely reduced. That road has 13,406 men in the traffic department and 14,551 men in the locomotive department. Of these only 33 per cent. of the traffic department men and 10.82 per cent. of the locomotive deparement men are required to work on Sundays, either full or part time. Moreover, a large proportion of these work only on alternate Sundays, or only occasionally or only for parts of the day. To illustrate—of the 4,413 men in the traffic department who work Sundays, only 319 work every Sunday, and of these, 86 only work the full day; 111 work for three hours, and the balance for varying fractions of the day. Similar proportions of Sunday-working men are found in the locomotive department. All this shows what can be done in the way of reducing Sunday labor. The congress disposed of the question by recommending a "periodical" rest for employés, to be made to coincide with Sunday as far as practicable.

The subject of railway statistics was found to present many difficult aspects. The need of universal railway statistics was freely conceded, but no scheme could be united upon. There is an international bureau of railway statistics in operation in Vienna, and although its work is valuable, it lacks comprehensiveness and leaves many points untouched. The difficulty lies in the varying practices of different countries and in the differing estimates of the values of unity. There is an unquestioned need of more complete statistics of the world's railways, and it is to be regretted that the convention accomplished nothing for their future preservation. There are many principles of railroading that can be considered properly only in the light of complete statistics. Although false conclusions may readily be drawn from misleading groupings of figures, and although "averaging" from such figures frequently leads to the choice of erroneous premises upon which to base theories of railway management, there still remains a large element of usefulness in such figures, and a plan of international groupings of statistics should be earnestly studied.

In this direction, among others, the greater benefits of a congress are to be sought. There is greater good to be gotten from international conferences and comparisons of experience when such questions as this and the theories of pooling, rate making, classification, rebates, stock watering, railway finance, railway bankruptcy and reörganization, receiverships, etc., are discussed, instead of mechanical questions. There is, in other words, more benefit to be derived from international discussions of the theories of railway management than from discussions of mechanical questions. The latter can be profitable, unquestionably, but not in the degree that the former will.—*Railway Review.*

PHILADELPHIA'S RAILWAY FACILITIES.

An enterprising Chicago newspaper recently made the startling statement that no less than twenty-two trunk lines of railway radiate from that city toward all points of the compass. These lines in turn send out their branches, forming a network comprising from 25,000 to 30,000 miles directly centering in Chicago—a vastly greater mileage than that of the entire railway system of Great Britain. This stupendous railway service exists in connection with a magnificent natural highway afforded by the chain of great lakes, on one of which Chicago is situated, and by means of which vessels of large size can transport freight and passengers between that city and other points in quite a number of states and Canada. The traffic on the lakes is very great, but the business done by the railways far surpasses it; and Chicago's phenomenal growth in population and commercial and manufacturing activity owes more to the railways centering there than to the natural advantage of the site of the city on Lake Michigan. Capital and business enterprise are attracted to points offering commercial advantages, and Chicago's admirable transportation facilities have induced the establishment there of all kinds of manufactories. By rail and lake the materials of manufacture can be drawn from an unlimited range, and, on the other hand, a boundless market for finished products is easily reached by over a score of railways, which actively compete with one another for the privilege of carrying the goods, and, consequently, render the service at the lowest rates known for transportation throughout the world.

In sharp contrast with the facilities for transportation afforded to the manufacturers and merchants of Chicago stands the meagre railway service vouchsafed to Philadelphia. Here is the principal manufacturing city of the country, in staple products, supplied with only two trunk lines, one of which forms the only connection Philadelphia at present commands with the west and south. Between Philadelphia and New York there are only two railway lines. Between Philadelphia and the anthracite coal regions there are also only two railway lines, for, though coal can be hauled over several routes by rail and canal, it must finally reach the city under the auspices of either the Philadelphia and Reading or the Pennsylvania Railroad. The Delaware river enables Philadelphia to transact a considerable maritime business, having in this respect but one complaint to make, which is the distance from the sea. Nevertheless, the coastwise trade of the city is very great and its foreign commerce is considerable. So far as water communication is concerned, Philadelphia is certainly abreast of Chicago, but compare the twenty-two trunk lines of the latter city with the two of the former, and observe how the city which Penn founded in 1692 is overshadowed by the Lake City, which was hardly known fifty years ago.

Not many years since quite a number of independent railways connected Philadelphia with inland towns from twenty to sixty miles distant. Some of them ran in the direction of the anthracite coal regions, and could have been extended thither if their owners had willed it, and Philadelphia manufacturers would undoubtedly have been greatly benefited in their ability to get cheaper coal than they have ever had. Other lines could have been extended to southern and western points, enlarging the market for Philadelphia goods, which have always had an excellent reputation for careful manufacture and honest composition. To-day there are in existence but two independent lines, the Pennsylvania Railroad Company having absorbed a large number, and the Philadelphia and Reading Railroad Company the remainder. Even the canals which extend into the interior of Pennsylvania and across New Jersey have passed into the control of these two companies and are operated in harmony with their railway lines, as Philadelphia shippers know thoroughly well. It is very unfortunate for Philadelphia that its minor railways have been controlled by unambitious capitalists who thought more of leasing their short lines for assured rentals than they did of developing their properties into great systems connecting the Quaker City with distant points.

Latterly Philadelphia has been favored with some promise of an important enlargement of its railway facilities. Adverse influences have been brought to bear against one of the projects, however, and at present the extension of the Baltimore and Ohio Railroad from Baltimore to Philadelphia, appears to be the only scheme in this direction that has any reasonable prospect of success. The completion of this new railway between Baltimore and Philadelphia is expected to be accomplished during the coming winter, when Philadelphia will be brought into direct communication with the vast territory reached by the most southern of the great east and west trunk

lines. This will be an epoch in the history of Philadelphia, and its citizens look forward to new growth with the wider opportunities thus opened to them. The legal fight over the South Pennsylvania Railroad, which was to form an outlet to the west via the Philadelphia and Reading Railroad, is regarded with interest, but with no hope that the Pennsylvania Railroad Company will be defeated in its plans to prevent the building of a parallel line; the influences arrayed against the new railway are too formidable. If, however, the legal authority of the commonwealth, which has been invoked, should decide that the persons who are in treaty for the abandonment of the proposed railway are guilty of an infraction of the state constitution, and should be able to prevent the proposed merger of the South Pennsylvania with the Pennsylvania Railroad, it is very probable that Philadelphia capitalists would join hands with Pittsburgh capitalists to complete a line so full of promise to both cities.

The business depression through which we are passing has taught many bitter lessons, but one of the most important is the lesson learned by the town or city dependent upon one railway. The residents of that town or city have paid passenger fares and freight rates that recognize no difference between good and bad times, for they maintain the old figures. The citizens of competing points, however, have been shown to what low rates it is possible for railway charges to fall, and it has often been possible for them to secure business from competitors at other points simply by reason of the difference in freight rates, although the successful establishment might have the longest haulage. So far as its western business is concerned, Philadelphia has realized the disadvantages of such a position. It is for its own citizens to determine whether the future will bring any change in this respect, for to the immense wealth controlled in the chief city of Pennsylvania all things should be possible, especially ready access to all the markets of the country.—*Iron Age.*

English Railways in 1884.

THE Board of Trade returns relating to the railways of the United Kingdom in the year 1884 have been issued. They show that during the twelve months 183 miles of new railway were opened—a somewhat smaller mileage than that constructed in 1883 and 1882. New capital to the extent of £15,155,000 was authorized, or considerably less than in 1883, but the total of £16,543,000 called up is about the same as in the previous year. Of this, the amount thus called up, about £5,000,000 was in ordinary, and similar amounts in preference and debenture stocks. As regards the revenue, the returns show that while the goods traffic fell off by £1,031,000, the passenger receipts increased £522,000 for the twelve months. The total goods receipts are, however, only about £70,000 below the 1882 figures. The increase of about 11,250,000 in the number of passengers carried compares with an increase of nearly 29,000,000 in the case of 1883 over the previous year. In the current year to date the passenger receipts also show a decrease. The companies in 1884 were able to effect savings amounting to £151,000 in the expenses, which left the net revenne £388,000 below the corresponding figures of the previous year. These net receipts represented 4.16 per cent. on the paid-up capital, as against 4.29 per cent. in 1884. The main features of the returns are summarized in the subjoined figures:

	1882.	1883.	1884.
Mileage	18,457	18,681	18,864
CAPITAL—Authorized	£877,711,005	£904,951,141	£920,106,030
Paid-up, total	767,899,570	784,921,312	801,464,367
Per mile	41,605	42,017	42,486
Ordinary	283,574,028	293,437,106	298,983,446
Guranteed	93,935,014	94,672,823	95,603,613
Preferential	201,114,958	200,888,198	205,809,234
Loans	17,042,059	15,323,505	14,793,420
Deb. stock	172,233,511	180,599,680	186,274,654
RECEIPTS—Passengers	28,796,813	29,508,733	30,030,450
Per cent. of total	41.51	41.53	42.58
Goods	£37,740,315	£38,701,317	£37,670,592
Per cent. of total	54.40	54.46	53.42
TOTAL TRAFFIC RECEIPTS	£66,537,128	£68,210,052	£67,701,042
Per mile	3,605	3,651	3,589
Per train mile	5s. 2d.	5s. 1d.	5s. 0d.
MISCELLANEOUS RECEIPTS,	£2,839,996	£2,852,218	£3,821,601
Per cent. of total	4.09	4.01	4.00
TOTAL RECEIPTS	£69,377,124	£71,062,270	£70.522,643
EXPENDITURE	36,160,436	37,368,562	37,217,197
Per cent. of total receipts.	52	53	53
NET RECEIPTS	£33,206,688	£33,693,708	£33,305,446
Per cent. paid-up capital	4.32	4.29	4.16
No. passengers carried	654,838,295	683,718,137	694,991,860

In the year the companies issued 766,691 season tickets, or 134,641 more than in 1883. Of minerals, 183,615,556 tons were passed over the lines, or about 5,870,000 tons decrease, and of general merchandise 75,712,330 tons, or 1,185,016 tons decrease. For the twelve months the passenger-trains ran 143,144,694 miles against 138,176,940 in 1884, and the goods and minerals, 126,672,783 miles against 127,983,253 in the previous year. As regards the rolling-stock, the companies now own 14,827 locomotives, 33,031 passenger-vehicles, 12,514 vehicles attached to passenger-trains, 454,945 wagons, and 12,236 miscellaneous vehicles, giving a grand total of 512,726 vehicles of all sorts.

Railway Enterprise in China.

ADVICES from China, we are informed, says the London *Times*, express surprise at the lack of business enterprise on the part of British manufacturers of locomotive engines, rolling-stock, and railway material, compared with that shown by their German competitors, who have, it is reported, dispatched agents to all parts of the Chinese empire with models and patterns, in search of orders. The last two loans floated in London are believed to be the forerunners of a series of similar operations, the proceeds of which are to be devoted to opening up the country by means of steam communication, and the enterprising Germans are apparently determined to be the first in the field if they can. The London *Daily Telegraph* also has the following in its money article, which we reproduce in order to endeavor to arouse our manufacturers to enter into healthy competition in a field where they have previously taken the lead entirely: "In connection with the loud complaints heard as to the depression of trade it may be interesting to note that the advices just received from China allude to the culpable indifference shown by English manufacturers to the opportunities for extending their business in that empire which have been created since the conclusion of peace with France. Taking for granted that China will ere long be opened up by railways, and, in anticipation of the first steps, representatives of leading German firms, such as Krupp, of Essen, and other nearly as celebrated, are, it appears, now busy securing concessions, taking contracts for rails, machinery, etc., and in various ways establishing in China a foothold which their own energy and ingenuity and the ever-watchful diplomacy of the German empire

may be trusted to render permanent. The process is similar to that which the Germans have found so effective in Japan, and will doubtless, unless checked, have similar results. The last number of *Kuhlow's Trade Review* contains, among other notices of German progress which are not very pleasant reading for an Englishman, a paragraph on trade with Japan, stating that a large contract for railway material, locomotives, and wagons had fallen to Düsseldorf and Deutz firms, and adding: 'This is said to be the first consignment from Europe to Japan, and it is very noteworthy that German manufacturers have secured two contracts in the face of British competition, which is driven out of the field in that distant island empire. The railway system of Japan has attained a length of 225 miles, and is increasing steadily.' If English producers have not utterly lost heart under prolonged depression they will take warning by such experiences, unless they are content to see the best of the Chinese trade pass into the hands of their rivals."

Export of American Locomotives.

It is not generally known that the export of locomotives alone is now large and nearly $3,000,000 in value yearly, and also that these instruments of power, traffic and transportation are doing something to honor the American name in countries rarely visited by an American steam vessel. According to *Bradstreet's*, during the fiscal year ending June 30th, 1884, 282 locomotive engines were exported from the United States to foreign countries, valued in the manifests at $2,819,946, or nearly $10,000 each. Of car-wheels the number sent was 14,335, value $135,133, and of stationary engines, 135, value $171,000. It would be safe to assume the railway motor material exported to be $3,000,000 in all, a very creditable aggregate, and just double the like export of 1881–82, when 133 locomotives were sent out, valued at $1,455,717. These locomotive exports for 1883–84 were to the following countries:

	Number.	Value.
Argentine Republic	65	$906,163
United States of Colombia (and Panama)	49	402,405
Mexico	34	341,865
Brazil	32	296,113
Dominion of Canada	27	208,339
Chili	19	232,569
Australia	14	107,000
Central America	14	113,600
Cuba	13	93,834
Spain	6	63,743
San Domingo	3	13,225
Sweden	3	25,000
Venezuela	2	9,870
England	1	6,616

This distribution is so wide and so well maintained for a series of years that there must be a definite cause to be found, and it is probably due to the one cause of superior quality. In the previous three fiscal years the exports were, 99 in 1881, 133 in 1882, and 219 in 1883, each ending June 30th of the year named.

It is shown by the export statistics of the last ten fiscal years that the locomotives sent from the United States to South America were 430 in number, valued at $4,541,166; 203 of these going to Brazil, 84 to Colombia, 72 to the Argentine Republic, 37 to Peru, and 31 to Chili. Canada and British Columbia have taken 208, valued at $1,908,129; Mexico 167, value $1,808,699; Australia 115, valued at $1,079,170; Cuba 88, $772,911; Russia 58, value $778,500; Central America 22, $108,022; Turkey 12, $182,00; Spain 9, England 8, and France 1, these last countries being less advanced in the science of transportation by rail than the countries using American engines, presumably.

It is altogether a remarkable record, and some points of probable importance are indicated. First, the American locomotive is built with a different position for the driving shafts communicating the power to the axle, the American being external and the English internal, or between the wheels. The valve-faces open internally in a narrow space, difficult of access, in the English engine. In the American they are open externally, and are readily accessible for refacing and repairs of the worn cylinder, while to reach the English valve-faces the machinery must be taken apart almost entirely, involving much delay. And because of this costly delay the engines are run until they are much worn, and steam is wasted as well as other risks incurred.

The English claim greater steadiness for the running of the interior connections, but the axle is a difficult piece to make, and it often breaks. Severe accidents with loss of life have recently occurred from a broken axle of this sort. Attempts have been made in England toward the use of the American device, but they were not persisted in. But the free choice of Australia has taken 115 of our engines on test of their working efficiency, Brazil over 200, the states of the river Plata 75, and thirty other countries more or less each, all for the same reason, that they proved more efficient in actual work.

A Wonderful Peruvian Railway.

One of the most wonderful pieces of engineering in the world is the railway stretching from Lima and Callao to the crest of the continent, where the famous mines of the Cerro del Pasco are, the source of the ancient riches of the country, from which tons upon tons of silver have been taken and which still hold, if the testimony of the mineralogists can be relied upon, the richest deposits on the surface of the world. The railway was never completed. Mr. Meiggs carried it from Lima to the crest of the Andes at a cost of $27,000,000 and 7,000 human lives, and gained for himself a reputation for energy and ability surpassing any man that ever came to this continent, but he died with 50 miles of track yet to be laid. No one has been found with the courage to finish the work, until a few weeks ago Michael Grace, of New York City, whose brother and partner in that enterprise is Mayor William R. Grace, made a contract with the government under the terms that he is to be given the road as it stands, with all its equipment, if he will complete it to its original destination. He agrees to complete the remaining 50 miles of railway and pump out of the mines of Cerro del Pasco the water that has been accumulating in them for half a lazy century, in consideration for which the government gives him that portion of the road already completed, and all the silver he can get out of the mines during the next 99 years, he paying the nominal rental of $25,000 a year for the use of the property. The sensation of riding up this railway, together with the rapid ascent from the sea level to the mountain's crest, produces a sickness called "siroche," often fatal, and usually sending people to bed for several weeks. The symptons are a terrible pressure upon the temples, nausea, bleeding of the nose and ears and faintness, but the effects can be avoided by taking precautions and observing rules that experience has sug-

gested, the chief ones being to take a glass of brandy and keep perfectly quiet, as the slightest degree of exercise will floor the strongest man. People who are compelled to make the ascent, if they have not become accustomed to it, usually take two or three days for the journey, stopping off at the stations along the line and going to bed at once upon reaching the town of Chicla, which stands at the summit.

"Railroad" and "Railway."

It would be a great boon to the whole community, says the *National Car-Builder*, and especially to newspaper writers and the publishers of railway literature, if the terms "Railroad" and "Railway" could be merged into one word, so as to do away with the senseless discrimination that is kept up between them. As it is not easy to invent a new name to supersede both words, one of them must be dropped or we must keep on using both as we are now doing. There are, it must be admitted, some serious obstacles in the way of a change. Sundry weekly journals, and other publications devoted to railway interests, have adopted one or the other of these terms as a part of their recognized names, and it is too much to expect that any of them will willingly change the name they have adopted for the mere purpose of getting rid of a term which some other journals regard as superfluous. It would be like striking their flag for the little matter of uniformity and convenience, when they might just as well keep it flying. But the thing will be done one of these days. It took years of agitation to get "standard time."

It may be asked, which of these words, "Railroad" or "Railway," is intrinsically the best? It may be a matter of taste, but our own bias is in favor of "Railway," and for obvious reasons. It is the shortest word, the most euphonious, the most easily articulated, and at the same quite as expressive and significant as its rival. "Railroad," on the other hand, is suggestively stiff, formal, heavy, strait-laced and solemn. But inasmuch as both names will continue to be used for a good while yet, in this country at least, there should be a uniform abbreviation for each, to be used when it is not desirable to write the words in full. As to what these abbreviations should be, we concur with the suggestions of the *Railway Age*, that "Rd" and "Ry" (without an apostrophe) are the most suitable for the respective words. We have not decided to introduce the proposed innovation in our columns, but the general adoption of something of the kind by leading railway journals is much to be desired.

Returns to Railway Capital in Germany.

The recently published statistics of the German Railroad Union for 1883, gives as follows the percentages on the capital invested earned by different groups of railways for successive years:

Railways.	1879.	1880.	1881.	1882.	1883.
German	5.41	4.48	4.49	4.72	4.65
Austrian-Hungarian	4.03	4.15	4.40	4.70	4.76
Dutch and other	3.46	3.83	3.82	4.53	4.90
Total Union	4.22	4.33	4.42	4.70	4.69

The profits of the German roads tend to decrease, possibly because they are chiefly state lines, which are not intended to yield a large profit. The profits of the line in Austria-Hungary and elsewhere increase pretty steadily. The largest profit by a German railway in 1883 was 9.59 per cent. by the Right Bank of Oder Railway. Four German roads earned more than 8 per cent., two more than 7 per cent., but no other earned as much as 6 per cent., while fourteen earned less than 3 per cent. In Austria the highest rate of profit was 16.12 per cent. by the Emperor Ferdinand Northern, and the next 9.40 per cent., while three others earned more than 8 per cent., two more than 7, and seven others more than 6 per cent. But twenty-six earned less than 3 per cent., twenty less than 2 per cent. and eight less than 1 per cent. In Poland, the Warsaw and Vienna Railway earned 13 per cent.; the one great Belgian company road earned 5.53 per cent., one Dutch road 6½, and another 6⅓.

The American Coal Fields.

In a lecture on coal, recently delivered at Philadelphia, it was stated that the United States has an area of 440,000 square miles of coal fields. 100,000,000 tons of coal were mined in the country last year, enough to run a ring around the earth at the equator 5½ feet wide and 5½ feet thick, and there is enough coal in the United States to supply the whole world for a period of 1,500 to 2,000 years. The question of the exhaustion of the coal supply, therefore, is not immediately important. The anthracite coal in Pennsylvania, it is stated, will last 250 years, while the bituminous coal in the same district will supply the world for fifty-seven years, and the United States for 350 years. The same lecturer stated that it took a prodigious amount of vegetable matter to form a layer of coal; that it was estimated that the present vegetable growth of the world would make a layer only one-eighth of an inch thick, and that it would take a million of years to form a coal-bed 100 feet thick.

The Michigan Car-Coupling Law.

The following is the full text of the law recently passed by the Michigan legislature in relation to automatic car-couplings:

"An act to provide for the introduction and use on all cars owned and operated by any railroad company or other corporation doing business in this state, of some form of automatic car-coupling, by means of which all cars may be coupled and uncoupled without the necessity of the brakeman or other person passing between the cars:

"Sec. 1. *The People of the State of Michigan enact*, that every railroad company on and after the first day of July, 1886, owning or operating a railroad or any portion of a railroad, wholly or partly in this state, shall place or cause to be placed, upon every freight-car thereafter constructed, purchased or leased by such corporation, and upon every freight-car owned or leased by such corporation which is sent to the shop for general repairs, or for repair of the coupling fixtures thereof, with the intent to use such car, such form of automatic or other safety coupler, at each end thereof, as the Commissioner of Railroads after examination and test of the same may prescribe. And such Commissioner of Railroads, on or before May 1, 1886, shall select two or more different patterns of automatic or safety couplers which will couple with each other, and

also with the link-and-pin coupler now generally in use, from which patterns said railroad companies may select couplers for use on cars, as required by this act.

"SEC. 2. The provisions of this act may be enforced by any Circuit Court of this state in a county through which the railroad of any company refusing to comply with such provisions may run, upon application of the Commissioner of Railroads, under such penalty as the said Court may determine, of not less than $100 for each violation of the provisions of this act."

Track-Walkers in Russia.

ON all railways in Russia track-walkers are necessary, and they frequently prevent the most frightful accidents. Any neglect of duty on their part may, on the contrary, lead to the most dreadful results. On one of the Russian roads the track is patrolled before each train by a watchman on each section, who carries forward a number found by him at the beginning of his section and left on a hook provided for it at the end, even numbers being carried in one direction and odd ones in the other. The numbers, which are painted on metal plates, are hung in view of the trains, so that officials passing can readily see them, and by means of a small table of the positions of the numbers on any day or hour can see whether the watchmen are doing their work. A hook without a number indicates the negligence of a watchman, who can be readily identified, since every watchman is required to give notice when he does not find a number at the beginning of his section, and must do so to avoid having the carelessness ascribed to him.

Improvements in Railway-Stations.

THE improvements which have recently been made in the construction of railway-stations in this part of the country have not received the public commendation it deserves, says the Boston *Herald*. A number of the railway companies that have their termini in Boston have lately built stations along their lines that are decided ornaments to the towns in which they are located. Until recently, a country or surburban station has been about the most disagreeable feature in the place in which it has been located. It has been architecturally ugly and thoroughly inconvenient, while the ground around it has been maintained in almost careful disorder. In this respect, American railway-stations have been in striking contrast with the railway-stations in Europe, which are ordinarily built with great taste, while the land in their immediate neighborhood is carefully laid out. The Boston and Albany, the Old Colony, and one or two other companies, seemed to have considered it expedient to copy this European model, and where new stations are built these have been constructed in a manner which cannot be too much commended. The influence of a fine station, with the ground around it carefully laid out, cannot fail to have its effect on the people of the town in which it is situated. Insensibly, the buildings in the vicinity will be improved, so as to bring them up to the level of the model of good taste that has been set, and by this simple means an object lesson of the greatest value will be taught in many different localities. Even on the score of utility, not a little can be said in favor of this new departure, for any thing which tends to make railway travel easier and more attractive, tends also to increase the patronage of the railway companies.

Standard Wheel-Tread and Flange.

THE Master Car-Builders' Association, through its secretary, announces the following as the result of the balloting by letter on the adoption of a standard wheel-tread and flange:

NEW YORK, September 22d, 1885.

SIR:—On the question, "Are you in favor of the adoption of the form of section, shown by the engraving in the accompanying circular, as a standard for the treads and flanges of cast-iron and steel-tired wheels?" there were 233 affirmative and 146 negative votes cast by the members of the Master Car-Builders' Association. As two-thirds of all the votes cast are required for the adoption of a standard, and as the proposed "form of section for the treads and flanges of cast-iron and steel-tired wheels" has not received that proportion of the votes, it is not adopted.

On the question. "Are you in favor of the adoption of the limits of 'variation' from the standard distance between the backs of flanges recommended by the committee, and described in the circular?" there were 368 affirmative and 14 negative votes cast. The "limits of variation"—4 feet 5¼ inches, 4 feet 5½ inches—are therefore adopted as standard dimensions of the Master Car-Builders' Association.

M. N. FORNEY, Secretary,
71 Broadway, New York.

WORK has begun on the Chautauqua Lake Railway, which is to be run on the east shore of the lake between Jamestown, N. Y., and Mayville, a distance of twenty miles, with the probability of being extended seven miles to Westfield on the Lake Shore Railway. Five hundred men will be employed until the road is finished. The Company also contemplates building a mammoth summer hotel at Long Point.

VICE-PRESIDENT E. S. BOWEN, of the New York, Lake Erie and Western Railroad, has resigned his position, owing to ill-health. Mr. S. M. Felton, Jr., has been chosen first vice-president in his place, and Mr. Charles Paine, second vice-president. Mr. W. M. Clements has been appointed to Mr. Paine's former position as general superintendent of the New York, Pennsylvania and Ohio Railroad.

THE Association of American Railroad Superintendents held their tenth semi-annual convention in New York City on October 15th. The association now numbers one hundred and fifty members. The next semi-annual meeting will be held in Cincinnati, on April 8th, 1885.

The color-blind test of the employés on the Chicago, St. Louis and Pittsburgh road, Indianapolis division, was completed recently, and out of 154 train employés and yardmen examined at Indianapolis, only five were deficient in vision.

Two Pullman sleeping-cars with side doors have been introduced on the Midland Railway, of England. They are shorter than those of the ordinary type, and have no end doors or platforms.

IN 1875, the railway mileage of Canada averaged one mile to 900 of population; at the close of 1884 it was one mile to 520 of population.

THE fall meeting of the General Time Convention was held in Chicago, on October 8th.

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NEW YORK, OCTOBER, 1885.

Principal Contents of this Number.

RAILWAYS AND THE TIMBER QUESTION.

WOOD is the world's natural fuel as it is the world's natural building material. Our sturdy ancestors, who when they desired fuel shouldered an axe and in the course of a few hours hewed down sufficient timber to last a month or two, and when they desired building material hauled their logs to the nearest saw-mill, would open their eyes in astonishment if they should visit us to-day and see the changes that have been wrought by time and wastefulness. As fuel, wood has long since ceased to be an important factor, and as far as railways are concerned it is practically abandoned. The decrease in the cost of coal and the increase in the cost of wood brought about by its growing scarcity, has practically made the "wood-burner" a curiosity in American locomotives; and this is not the worst of it. So scarce has timber become, and, as at present indicated, so inadequate will be the future supply to the future demand, that railways are confronted with a scarcity of timber for ties, that in a very short time may necessitate an entire change in track-construction, and the employment of a substitute for wood.

Undoubtedly metallic ties are gaining ground, and railway inventors are devoting much time to the perfection of a metal tie that shall effectively supplant the wooden tie, and, at the same time, possess the attributes of simplicity, strength and cheapness. This is one way out of the difficulty, and to a greater or less extent it will be followed; but there is no reason why railways should not anticipate the calamities following a possible scarcity of tie-timber before the metallic tie is an assured success and a device generally adopted. The American Forestry Congress is doing good work in the protection and development of American forests, and the railways should lend them encouragement and substantial aid. The ruthless destruction of forests and the absurd tariff upon Canadian timber are two salient points of attack, and public opinion is ready to sustain a well-directed effort pointing to the preservation and growth of timber in this country. State laws can do much to restrain the wasteful destruction of forests, but congressional action is necessary to affect the tariff upon imported timber, and there is, happily, some hope that the greedy lumbermen of the northwest, who in their desire to "foster" American industries would prevent the importation of Canadian lumber, consequently depleting the timber supply of this country, will not be so tenderly considered as formerly. Unfortunately, both the senate and the house of representatives are not without members who have acquired and are acquiring fortunes from the timber industry, and, of course, their voices will be raised in favor of what they style "protection"—a very different kind of protection from that contemplated by the Forestry Congress. Still,

we are inclined to believe that public opinion will be too strong for these patriotic legislators.

It is not only in the matter of tie material that the timber question appeals directly to railways, but also in car-construction. With nearly a million freight-cars in the country, constantly wearing out and requiring replacement, and a proportionately large number of passenger-cars constructed of and finished in expensive woods, a scarcity of timber presents other unpleasant probabilities that should act as incentives to the protection of American forestry by American railways.

At the recent meeting of the Forestry Congress, held in Boston last month, the subject was considered at length and steps taken to institute a general protection of timber, and the labors of the Congress will probably be productive of good results. Certainly they are worthy of cordial support by American railways, and in this connection a little thrust was given the latter by Superinten-LAUDER, of the Old Colony Railroad, who dwelt feelingly upon the necessity for efficient spark-arresters on our locomotives. Unquestionably a large portion of our forest fires are due to flying sparks from locomotives, and practical means in which railways could aid in the preservation of timber are at once presented in this home problem that can and should be diligently studied and solved.

AN OLD-FASHIONED REMEDY.

WE always like to have a text for an editorial homily, and an old reader furnishes us with an admirable one. The following extracts are taken from a letter he sends us:

"I am surprised to note in your editorial of last month, that you disapprove of further railway construction for the present. While it is true that the railways have suffered through the universal depression of the last two years, it is equally true that railway construction in this country is not keeping pace with the increase and demands of population, and that we are very much behind other leading countries in this respect. Vast and fertile tracts of territory lie idle solely through their remoteness from railway communication, and while in the east it is quite possible that railway construction might for a time cease, in the west and south I fail to see that the country or the railway industry would be benefited by such cessation. Please explain how you can reconcile your avowed advocacy of railway interests to your theory of cessation."

Willingly. Our correspondent writes to the point, and desires honest information. He is entitled to have it and we will furnish it so far as it lies in our power.

In the first place, it is necessary for us to dispute a statement of his, the truth of which he assumes as recognized. He asserts as an acknowledged fact that "railway construction in this country is not keeping pace with the increase and demands of population, and that we are very much behind other leading countries in this respect." We beg to differ from him. Per capita of population, the United States possesses a greater railway mileage than any other leading country. Apportioning this mileage according to states and territories we find that this relative proportion of mileage is well kept up, and that one state, New Jersey, possesses a greater railway mileage in proportion to its area than any other governmental division of the world. It would be manifestly unfair to contrast the country as a whole, with its tracts of undeveloped and, in many instances, sterile and uninhabitable land, with a thickly-settled country of Europe, and estimate its comparative mileage on the basis of territory. Apart from this error our correspondent speaks truly, and we will now endeavor to explain our seeming inconsistency.

We grant that there is need of railway construction in certain portions of the country—in the west and south, as he claims, and also in the northwest. In these regions there are green fields and pastures new only awaiting the advent of railway facilities before a goodly emigration will take place, and a strong tide of population set in. In healthy times railway construction in such territory could not begin too quickly, and in healthy times we would urge its immediate commencement. But the times are not healthy. We have passed—if indeed we are not still passing—through a period of unhealthy railway speculation; we have seen railway after railway tumble into the hands of receivers; we have seen railway investors drop from riches to penury in a day, and we are forced to conclude that the country has suffered and is suffering with what may be termed a "railway fever." Now there is an old regiminal rule regarding the treatment of fevers which still obtains in country districts—"feed a cold and starve a fever"—and we believe in it heartily. We admit that the demands for increased railway facilities in some sections are pressing, but we also believe that these sections can afford to wait a year or two before their demands meet with compliance. The fever-stricken condition of our railway industry demands that its powers of digestion be given a rest, and a little healthy hunger will do no harm. The fertility our correspondent speaks of will remain in these sections despite the continued absence of railways, and in two or three years the lands will smile with richness as now. It takes strength to develop such sections, and the railways have not yet strength enough to undertake the task. Give them a year or two of rest, and when they have entirely recovered their vigor—when the speculative features of railway construction have disappeared—when sufficient safeguards are thrown around railway operation to prevent paralleling—then we may consider the time arrived for the resumption of railway construction.

In the early days of railways in this country the great political parties of the nation were divided on the question of "internal improvements," and congress rang with animated debates on the subject. The JOURNAL was, even at that remote period, an established paper of some years' standing, and it came out squarely in favor

of the improvement agitation. So much so, in fact, that it bore as a sub-title, "Advocate of Internal Improvements." But the circumstances were widely different from those now existing. Then the country was suffering for lack of means of necessary communication. Interstate traffic was clogged and dull, and, to continue the simile, a "railway cold" had settled upon the country. Pursuing the homely treatment, and in strict accordance with the before-mentioned rule, the JOURNAL then urged the remedy of "feeding the cold." The position of the JOURNAL is the same now as then, and in both cases it spoke in what it considered the true interests of American railways.

Whether or not our correspondent is satisfied with this explanation we cannot say, but we have answered him in the same honest spirit in which he requested information. We believe that the present condition of the railway industry is such that a general cessation of railway construction for a brief period is the best and truest remedy for present ills. The discomforts that may temporarily follow would be but trifling and evanescent compared to the healthy reaction that would take place, and the country would be better and stronger for it in the end.

Still, no physician is infallible, and possibly a better treatment than ours may be suggested. If so, we would be glad to hear it and be among the first to urge its adoption. A good physician should avoid bigotry and dogmatism.

EDITORIAL NOTES.

ONE dollar from New York to Chicago! That is the rate charged emigrants by the Pennsylvania Railroad, and under contract that rate will prevail until February, while other roads are charging thirteen dollars for the same transportation. Possibly the Pennsylvania will get the bulk of the emigrant travel, but the other roads will most certainly reap the greater profit. They would do that if they charged two hundred hundred dollars for the trip and carried no passengers at all, for zero is mathematically greater than a minus quantity, which the profits of the dollar traffic must be of necessity. There will shortly be an end to this emigrants' picnic, however, for a pooling agreement has been entered into that will raise the rates at the expiration of the period of contract, and in the meantime there will be a brisk and profitable speculation in the purchase and sale of the dollar tickets.

* * *

THE North, Central and South American Exposition, the revived New Orleans Exposition, starts out well upon its career and will be open to the public on November 10th. The failure of last year's exposition at New Orleans was a source of much regret, though the mismanagement which characterized it was alone to blame, but judging by the prospectus issued by the new management a very different policy will be pursued. A feature of the exposition will be a series of special days for special personages and industries, somewhat after the manner of the state days at the Centennial Exposition of 1876. The opening day is appropriately to be the "American Peace Day" and thereafter will come, in quick succession, days devoted to the governors of states, the press, to musicians, to bankers, to mayors of cities, and to members of congress, while New Year's Day is to be a celebration of Emancipation. This, coming from the south, is a graceful compliment to the nation. January 12th is to be the day of an American Railway Congress, and all American railways are desired to send delegates to represent them. In their second endeavor to hold a representative exposition, the people of the south should meet with encouragement from the north, and doubtless will.

* * *

THE Pennsylvania road is one of the few roads, if not the only road, that has instructed its employés in the subject of railway sanitation. It does not content itself with general instructions either, but furnishes and distributes a disinfecting fluid with directions for use. Fortunately the country has been spared a visitation of the cholera this year, and we have no cause to fear the introduction and spread of that disease until next spring, if at all, but the attention of the Pennsylvania management to this important subject of sanitation has not been thrown away. It will bear fruit in the future.

* * *

WHILE awaiting the cholera and anxiously watching its spread in distant lands, we are are suddenly surprised by finding another equally dreaded disease at our very doors. It does not seem possible that the small-pox can can be confined to Montreal and the surrounding territory where it is now raging, but with proper care its importation can be confined to the sporadic cases which will find their way to us despite the utmost watchfulness. Thank God we have not among us such bigotry and superstition as characterize the ignorant classes of Montreal, but it is far from being true that vaccination is universal even among intelligent people. It is, however, clearly the duty of railways whose lines reach the plague-stricken districts, to see to it that their employés take the simple precaution of being vaccinated. If such precaution does little else than relieve the railways of the responsibilities of carrying the contagion through the agency of their own operatives, it will yield sufficient return.

* * *

JUDGING by the present aspect of affairs there is to be a lively little war in Europe, in which Turkey, Greece, Servia, Bulgaria, and a few petty principalities will take part. It is doubtful if any of the great powers will meddle with

the matter otherwise than diplomatically, but their are numerous individuals in this country who would gladly welcome a general European war as a "boom" to business on this side of the Atlantic. Heaven forefend that we should be favored with prosperity built upon the necessities of war. We passed through one such experience twenty-five years ago when the strife was on our own soil, and we know the harvest reaped from that kind of business prosperity. It is the delirium of prosperity—a delusive fantasy—and no permanent well-being can be built upon the miseries of humanity.

* * *

ECONOMY has struck the New York Stock Exchange, and some of the offices connected with the establishment are to be abolished, others are to be combined in one, and a general reduction of salaries is to be made. Notwithstanding this indication of lessened resources a seat on the exchange sold a few days since for $30,000, the highest price realized for a seat in several years. What means this sudden retrenchment? In this instance economy resembles the individual who struck Billy Patterson. It is hard to trace and the reason for the attack is somewhat shrouded in mystery.

* * *

FOR the benefit of railway patentees we state a claim made that nine-tenths of the capital invested in American manufactures is so invested owing to the security given it by patents. And in no field is the patentee so sure of reaping a rich harvest from a really good invention as in the field offered by the requirements of our railways.

The Century, for October, is an excellent number, and contains the usual amount of interesting matter and artistic engravings. The subject of General Grant is awarded considerable space, and it might in truth be called the "Grant issue." Among the articles on the deceased hero is an illustrated paper by Gen. Badeau on "The Last Days of Grant," another by Gen. Porter on "Lincoln and Grant," "Reminiscences of General Grant," by Gen. Wilson; an illustrated article on "Riverside Park," by William A. Stiles; "Taps," a poem by F. E. Newton, and a poem by Richard Watson Gilder, entitled "The Dead Comrade." One contribution is of special railway interest, "The Canada Pacific Railway," an historical sketch by Geo. M. Grant. These articles form but a brief portion of the attractive reading in the October *Century*.

A MOST useful and interesting work is to be found in the "Biographical Directory of the Railway Officials of America," published by the Railway Age Publishing Company, of Chicago. It presents an admirably compiled alphabetical list of the general and division officers of the railways on the American continent, with their official position and post office addresses, followed by brief biographical notices and records of their railway service. The book is handsomely prepared and is illustrated with twenty-six portraits of distinguished railway men, an appropriate frontispiece being the portrait of George Stephenson. The work is a valuable addition to railway literature, and deserves an extended sale. It is sold for $4.

Sechrist's Hand-Book and Railway Equipment and Mileage Guide is published monthly at Chicago by J. B. Savage, under the auspices of the Car Accountants' Association of the United States and Canada. It contains a complete record of the passenger and freight equipment of all railways, number of cars, dimensions, etc., general railway officers and location of railway offices, an alphabetical arrangement of connections and conjunctional points were cars are interchanged, and a large amount of valuable information which is compiled and corrected monthly. The publication was warmly endorsed at the recent meeting of the Car Accountants' Association.

CASSELL & CO.'S *Magazine of Art*, for November, is an unusually attractive number even for that publication where every number is attractive. The leading article, "Burnham Beeches," is illustrated with wood engravings of exquisite softness. As an art journal the magazine stands confessedly at the front.

MR. EDMUND C. PECHIN, M. E., has become associated with the editorship of the *Iron Trade Review*. Mr. Pechin is a prominent member of the American Institute of Mining Engineers, and in addition to his editorial work will prepare special contributions for the *Review* on metallurgical topics.

The Electrical Review, an exceedingly able weekly journal devoted to the subject of electric lighting, the telephone, telegraphy and scientific progress generally, is received and is a welcome visitor. It is published in this city by the Electrical Review Publishing Company, at $3 per year.

MR. THOMAS M. GRIFFITH, C. E., a frequent contributor to the JOURNAL, is the author of an illustrated pamphlet of more than usual interest, entitled "A Brief History of Suspension Bridges." It is published by the Trenton Iron Company.

The Signal Light is a literary journal for railway men published in Chicago, by J. P. Dargitz, late traveling auditor of the Chicago, Burlington and Quincy Railroad. It has a special department devoted to hygiene.

The American Journal of Railway Appliances, hitherto published semi-monthly, now appears as a weekly. The general character of the publication remains the same, and its subscription price is unchanged.

A NEW London exchange is received in the *Railway and Shipping Contractor and Storekeepers' Journal*. Though but in its third issue it appears to be on the high-road to prosperity.

A NUMBER of early reports of the Master Car-Builders' Association have been published in pamphlet form, including the first six annual reports from 1867 to 1872.

The Exporter is the title of an interesting English periodical published in Hamburg, and devoted to commercial and industrial interests.

The Cincinnati Artisan is an interesting monthly publication issued in Cincinnati, O., and devoted to practical science and general industries.

THE railway guides for October, *Appletons'* and the *Travelers'*, are both received, corrected to date.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

MORE STATE ASSOCIATIONS NEEDED.

THE St. Louis meeting of the American Street-Railway Association on the 21st of this month, will be the chief event of the year so far as the interests of American street-railways are concerned. We have often dwelt upon the usefulness of the organization, and have urged that membership therein should be acquired by every street-railway company in the country; but with the acquisition of such membership the street-railways should not cease their efforts to obtain organized and concerted action. Our territory is a wide one, and every state has certain laws and regulations concerning street-railways that are peculiar to itself. Unwise street-railway legislation is most common, and there is scarcely a state in which wise and concerted action on the part of the street-railways operating therein would not be followed by beneficial results. The organization of state associations is an imperative duty on the part of the street-ways. Individually they can do little; collectively they would form a power well-nigh irresistable when on the right side of pertinent questions.

As far as we know there are but two state associations of street-railways; the Street-Railway Association of the State of New York, and the Ohio State Tramway Association. An inspection of the minutes of the annual meetings of these organizations shows that they are doing as great work in their own states as is the American Association throughout the whole country, and being confined in their actions to the limits of a single commonwealth, their field is a comparatively easy one in which to operate. The New York Association now has a membership of twenty-six state companies, and the Ohio Association a membership of twenty-five. The meetings of the organizations have been well attended, the cost of maintenace slight, and each have been favored with many valuable reports and discussions on matters of the greatest importance to street-railways. There appears to be no reason why similar associations should not at once be organized in Pennsylvania, Massachusetts, Illinois, and other states where street-railways are extensively operated, nor is it necessary that such missionary work be confined to the larger states, for they would serve a useful purpose in any state or territoy.

More street-railway associations are wanted, and we hope and believe they will shortly come into existence and be recognized as organizations of importance and authority.

ST. LOUIS will be favored with two street-railway "events" this month. The American Street-Railway Association meets there on the 21st, and there has been a great street-railway strike in the city. We understand that the strike is pretty well over by this time, and that the worthy delegates to the street-railway convention will not be treated to the workings of a strike as a part of their entertainment. Such a sight would no doubt be instructive, but it would not enhance the pleasures of the gathering. We trust, at any rate, that the strike is not one of the features of entertainment that the St. Louis companies propose to furnish their guests of the association.

CAR-STARTERS.

BY AUGUSTINE W. WRIGHT.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE question of car-starters is one of interest to every horse-railway, for the original cost and renewal of horse-flesh is no inconsiderable item of the operating expenses. I made a number of experiments to ascertain how much greater force was exerted by a team in *starting* a loaded street-car, than was required to keep the said car in motion at an average speed of six miles per hour. I selected steady teams and good drivers, and under these favorable conditions found that upon new steel-rail tracks 7.1 times the power was exerted to start the car, and upon old iron-rail with low joints 4.1 times the power used to maintain the speed after starting (see *American Engineer* for 1881, page 103). The power required to keep the car in motion was much less upon the new steel-rail track, and shows that the better the tracks the greater the relative loss in starting the loaded car. With a poor driver, who allows his team to start quickly, the relative loss is much greater and no inconsiderable inconvenience is caused the unlucky passengers.

It is chiefly the wear and tear of starting the heavy load of car and passengers which give our horses such brief railway lives. If the pavement in the horse-paths consists of any other than well selected cobble-stones of suitable size and shape, the horses slip and frequently strain their backs; an injury from which they never recover. To guard against this slipping during unfavorable seasons of the year, their shoes are removed and caulks sharpened. When our horses were traveling upon wooden blocks, at times their shoes were removed and sharpened every *third day*. This caused rapid hoof depreciation, but was the only way to keep them upon their feet.

This state of affairs has caused inventors to turn their attention to "car-starters," and, I presume, each horse-

railway official has been bored by these inventors to the same extent as myself, rendering life almost a burden. I presume there are not far from 2,500 car-starter patents in the United States. Probably thirty are brought to my individual notice each year. They can be divided into these two general classes:

1. Those in which, by means of springs, the momentum of the car and its load is stored up to assist in starting. This class is utterly impracticable. In practice I have never found one that would work. In theory Prof. Johnson, of Washington University, St. Louis, has demonstrated mathematically, *a.* "That it is quite impracticable to store the energy of a loaded street-car, moving at the the rate of six miles per hour with springs. *b.* That a considerable portion of this energy may be stored in a small cylinder of compressed-air and made available for starting the car. *c.* That the increased expenditure of animal-power necessary to transport the apparatus would be more than the saving that could possibly be effected by storing the energy of the moving car." (*Journal of Association of Engineering Societies*, vol. 4, page 293).

2. By means of leverage. This system I believe practicable, but the machinery must be strong and light, so that the energy saved in starting may not be lost in transporting it during the time when it is not in use. It must be cheap and readily applied to existing cars without requiring any cutting of woodwork or changes in their construction. It must be simple, with few wearing surfaces to be cut by the sharp grit arising from the street. It must be automatic, worked by the team without intervention of the driver. We all know that the driver, when out of sight, is not going to trouble himself to assist the horses. Horse-railways would undoubtedly welcome such an auxiliary to their horse-flesh, for it means a saving of many thousands of dollars in operating expenses.

So many hundreds of car-starters have been invented and tried without success, that horse-railway officials will fight shy of anything of the kind until *actual* success in practical every-day working shall have demonstrated the advantage and value of some leverage machine, and inventors will experience great difficulty in persuading horse-railways to *try* their machines. The problem is beset with difficulties.

STREET-RAILWAY LEGISLATION.

BY A. J. MULLANE.

[A Paper read before the Convention of the Ohio State Tramway Association.]

I.

LEGISLATION affecting street-railroads is a very fruitful subject. Like the street-railroads themselves, its origin is modern and its growth rapid and varied. It is not the purpose of this article to recite its history in detail, or to speculate upon its future. Our purpose should rather be to investigate some of the questions which are vital to the economical construction and operation of street-railroads, in view of the public objects to be accomplished by them and in the light of the experience we have gained in their management. But it should not be forgotten that, in Ohio, street-railroads actually preceded state legislation upon that subject, and that the necessities disclosed in operating the roads preceded the various changes which have been made in that legislation; in short, the existence and progress of street-railroad traffic have been the essential prerequisites of obtaining proper legislation for its protection and encouragement. The first street-railroad in Ohio was constructed in 1859, and the first State legislation upon that subject was enacted in 1860. The right to construct such roads and their presence in the beginning met with vigorous opposition both from property-holders and the old-fashioned passenger-carriers. Ever since then the roads have been engaged in struggles either for an existence or to avoid destruction.

However, since their advantages have been realized by the public. *legitimate* enterprises in this line have met with but little or no opposition. The struggles latterly have been either against or with what may be termed, in a public sense, as unnecessary railroads. Consequently, the efforts of those who have been engaged in the street-railroad traffic for the purposes of legitimate profit or investment have been to procure statutory safeguards for both the public and the companies; and it is encouraging to note how the changes in state legislation have been adapted to the reasonable demands of the public and the protection of the companies. The statutes disclose, even to a casual observer, an admonition that companies will not be granted rights which are inconsistent with the public weal, and also a guaranty that the companies shall not be deprived of reasonable profits by the raids of blackmailers acting under the guise of public benefactors.

The lesson, then, which we should take from the foregoing is this: that in so far as this association, from its experience in street-railroad matters, can fairly show to the state authorities a necessity for preserving the present statutes, as well as for making any slight changes, both may be accomplished.

This brings me to a very brief consideration of the legislation we have, and of some more that we need. As to existing legislation, none is of as great importance to the owners of existing street-railroads as the statute which was passed April 18th, 1883. When the subject of street-railroads is reduced to its last analysis, the object of having them is twofold: (1.) the safest and quickest transit at the cheapest rates of fare that are practicable within all the necessary parts of densely populated communities; (2.) safe investments and fair and reasonable profits to the owners of the roads.

It will be found upon examination of the Act of 1883, that these objects can be accomplished in favor of both the public and the companies.

I cannot here recite the provisions of that statute. Indeed, I presume that all of you are somewhat familiar with it. I beg of you, however, to study it in connection with the operation of your various street-railroad systems. You will find that where street-railroads are necessary for the public convenience, there is not the slightest difficulty in the way of procuring the requisite consents and grants. You will discover, also, that where street-railroads are not necessary for public purposes, grants cannot without great difficulty be obtained for the mere purpose of impairing the value of existing roads, or compelling the purchase of unnecessary grants. Surely no such statute can do harm to any legitimate enterprises or furnish unnecessary protection for existing companies. Its preservation upon the statute books should, therefore, be one of the prime objects and efforts of this association.

claim of the original application, but whether the specifications of that application fairly indicate all that was put into the claim. It is insisted by counsel of the defendants that the claims contain nothing new, and that the invention has been anticipated. This is probably true, says the Court, so far as the elements of the combination are concerned. No matter though how old the several elements are. Have they been placed in such relation to each other that their joint action produces a new and useful result? The date of the present invention is February 19th, 1877, as the uncontradicted testimony of the case shows. Laying aside all patents which do not antedate that time, none are left that cover the combination of the complainant's mechanism. Therefore a decree is entered for the complainants.

The Montreal Cable Railway.

THE cable railway or elevator by which the summit of Mount Royal, back of Montreal, is reached, has now been in successful operation for some days. The railway is 403 feet horizontal measurement, the height 275 feet, and the length of track 510 feet. It is built in a segment of a circle with a reversed side of twelve feet, and has an incline of about 33½ degrees, The road is supported by 16 iron pillars set in stone foundations, and the balances are of wood 12 x 12 inches. The gauge of the road is 5 feet, with a distance between the tracks of 4 feet. The cars are drawn to the top by means of a stationary engine of 75 horse-power at the top of the mountain. The wire ropes are three in number, two of them being 1⅛ inch diameter and the middle one 1¼ inch. The two smaller ones have been tested with a strain of 35 tons and the centre or safety rope with a strain of 43 tons. The ropes pass over sheaves 6 feet in diameter, and are wound over two drums of wood and iron 10 feet in diameter, and are a direct pull upon the cars. The centre or safety rope runs independently of the engine, and is attached to both cars, so that, in event of the two ouside ropes breaking, the centre one would hold the cars in check, beside which, the large wheel of 11 feet diameter is provided with brakes which may be applied from the platform at the top of the incline by the engineer. The fare on the incline is 5 cents up and 3 cents down.

Power Required on the New York Elevated Railways.

A TEST of a locomotive in operation on the Third Avenue Elevated Railway, was recently made by Mr. Angus Sinclair, and described in the *National Car-Builder;* the engine drawing the usual load of a train of four cars weighing some 66 tons, over its route of 8½ miles, making twenty-five stops. The engine weighs 24 tons; cylinders, 11 by 16 inches; average indicated horse-power, 163.4; running time, 20 minutes; stopping at stations, 22 minutes. The effect of the great number of stops is shown in the fact that the average train resistance reached 42 pounds per train-ton, which is about five times the estimate of the pull on the draw-bar if the motion of the train could be continuous. The average horse-power exerted by the locomotive, including time and stations, is 77.8; and as there are 63 trains on the road at the same time, there is an aggregate expenditure of 4,901 horse-power on the road. The evaporation of the boiler on the basis of all coal used, without making any allowances, was 7.4 pounds of water per pound of coal; and the hourly consumption of coal was 5.8 pounds per horse-power.

Women as Conductors.

IN Valparaiso, the conductors on the street-cars are women. During the war, when most of the men of Chili were sent to fight Peru, the employment of women in this capacity was found successful, and they have since been kept. They are usually girls from twenty to twenty-five years of age, dressed in a natty uniform of blue flannel, with jaunty Panama hats and white pinafores.

STREET-RAILWAY NOTES.

THE mayor and board of aldermen of Manchester, N. H., at a meeting held September 22nd, granted the request of the Manchester Horse-Railroad for an extension of its lines in an easterly direction. The branch will run up Manchester street to Hall, and southward on Hall to Merrimack street.

THE Beatrice (Neb.) Street-Car Companv has been incorporated with a capital stock of $50,000, divided into shares of $100 each. The object of the company is to build and operate a line of street-railway along the streets of the town of Beatrice, Gage county, and the adjoining country.

A CHARTER has been granted to the Eastern Heights Railroad Company, of Pittsburgh, Pa., to construct a line from a point on Fifth avenue, near Ross street, to Wilkinsburg, a distance of about seven miles. The capital stock of the new company will be $300,000.

THE new street-railway recently opened in Oswego, N. Y., has been largely patronized. It is the first street-railway in Oswego, although the city has had for some time a population of more than 20,000.

THE Citizens' Street-Railway Company, of Worcester, Mass., has been organized. The length of the proposed line is eight miles, and the capital stock of the company is $100,000.

THE Kings County (N. Y.) Elevated Railway comtemplate building an elevated road on Fulton street, Brooklyn, from Hudson avenue to East New York, at a cost of $2,000,000.

THE Uptown Fifth Avenue Railway Company of New York City, was incorporated on September 28th, with a capital stock of $2,000,000.

IN the department of New Inventions of this month's JOURNAL is published the description of a new construction of street-car.

THE Capital City Street-Railroad Company will be incorporated in Atlanta, Ga. Capital stock will probably be $50,000.

THE Glens Falls, (N. Y.) Sandy Hill and Fort Edward Street-Railway is now in operation.

A LINE of street-railway will probably be constructed soon in Clarksville, Tenn.

THE new street-railway in Lincoln, Neb., is now in operation.

New Inventions.

Gerhardt's Car-Truck.

JOHN GERHARDT, of Montreal, Queb., Canada, is the inventor of an improved safety-truck appliance for railway-cars, which is herewith illustrated and described. The invention is designed to prevent the trucks of a railway-car from "slewing" or ditching when from any cause—such as an open switch or any form of derailment—the wheels leave the track; and, further, in such a case, to keep the trucks in their usual position with respect to the car. The invention will be equally effective in keeping the truck-frames parallel with the car in the case of a broken axle. It may be briefly described as consisting in the attachment, loosely, of the truck-frames to the framing of the car by rods placed on either side of such trucks. These rods are usually, although not necessarily, attached to the truck-frames on their inner sides at or near the corners, and thence are preferably taken up obliquely to and secured to the longitudinals of the car at a point or points nearer to the center than the trucks. Sufficient play is allowed to permit the trucks to accommodate themselves to curves, the amount of radiation required being adjusted at will.

In the accompanying cuts, Fig. 1 is a plan of the under side of a car-body, looking up, one of the trucks shown being that of a passenger-car and the other that of a freight-car; Fig. 2 a side view of the same, and Figs. 3 and 4 details of the fastenings of the rods.

A A are plates, secured by bolts or other suitable means to the under side of the longitudinals, preferably at about the positions shown, A′ being perforated projections or bosses cast or formed on the same. Through this projection passes one end of a rod B, which is preferably threaded for some distance and provided with jam-nuts *b b*, to secure it in place. The distance apart of these jam-nuts gives the amount of play, and they may, for greater security, be doubled or provided with lock-nuts. To prevent the wear of the thread on the rod by friction in the aperture of A′, at that point a sleeve *b*′, shown in detail in Fig. 3, is slipped over it. On the other end of the rod B, is formed an eye B′, corresponding to a double eye formed on the end of a plate C, secured, as shown, to the angle of the truck-frame D, the junction being made by an eyebolt or rivet *c*, or in any other usual manner.

As shown in Fig. 1, this construction may be slightly modified, the principle, however, remaining the same. The rods B, may be taken obliquely to a single plate A, secured to the car-frame at some point on its longitudinal axis and doubly perforated to receive the ends of both. In some cases it may be found desirable to do away altogether with the plates A A, and carry the rods, in the one case, through the transverse stringers, and, in the other, through the longitudinals, these being perforated for the purpose and strengthened by plates on either side. Another modification which may be made is the substitution for the jam and lock-nuts of a shoulder formed on the rod, and a cotter inserted into such rod at the distance required to afford the necessary play.

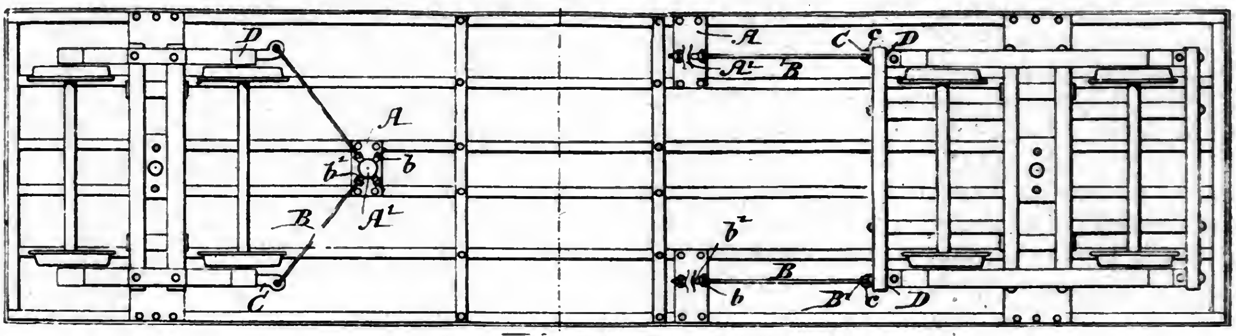


Fig. 1.
GERHARDT'S CAR-TRUCK.

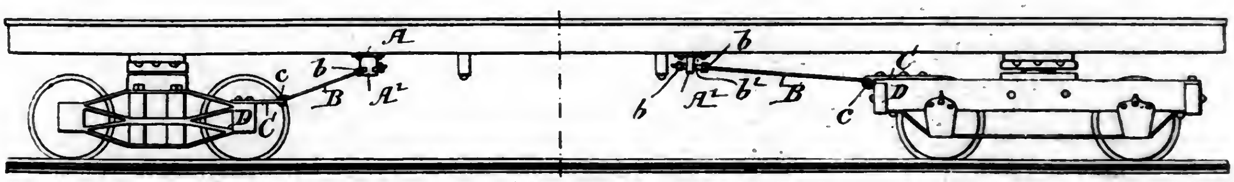


Fig. 2.
GERHARDT'S CAR-TRUCK.

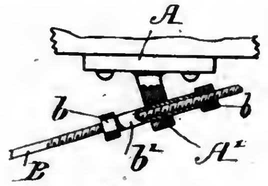


Fig. 3.

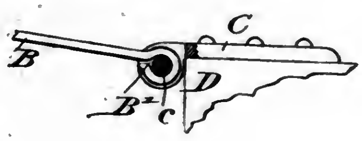


Fig. 4.

GERHARDT'S CAR-TRUCK.

Either of the constructions above described allows the truck to swivel on the king-bolt sufficiently to accommodate itself to curvature, the amount of play being, as before mentioned, regulated by the distance apart of the jam-nuts or shoulder and cotter. It is obvious that beyond this amount of play it is impossible for the truck to "slew," and that therefore whenever, from any cause, the

wheels of a truck leave the track, the truck is still held by the rods in the proper position with relation to the car, and the wheels follow the track, thus doing away with the chance of ditching, going down embankments, and all accidents of this class. It will also be noticed that any strain upon the rods is in the direction of their length, and therefore of their greatest strength.

The invention is applicable to freight-cars of all kinds, passenger-cars and sleeping-cars, and can also be fitted to the trucks of locomotives and their tenders. In no case is any alteration required in the present mechanism for brakes, etc. Two severe experimental tests given the device on the Canadian Pacific Railway resulted satisfactorily, and demonstrated its practicability.

The device is now entirely controlled by S. Davis, of the firm of S. Davis & Sons, Cote street, Montreal, Quebec, to whom the patent-rights have been assigned, and to whom all communications should be addressed. It is Mr. Davis' intention to introduce the appliance in the United States as soon as patents have been received in all foreign countries.

Stewart's Street-Car.

TIMOTHY B. STEWART, of Hartford, Conn., has recently devised and patented an improved car for street-railways, which is herewith illustrated and described.

In the accompanying cuts, Fig. 1 is an end view of a street-car that embodies the improvements, part only of the new features being shown; Fig. 2 a top view of such

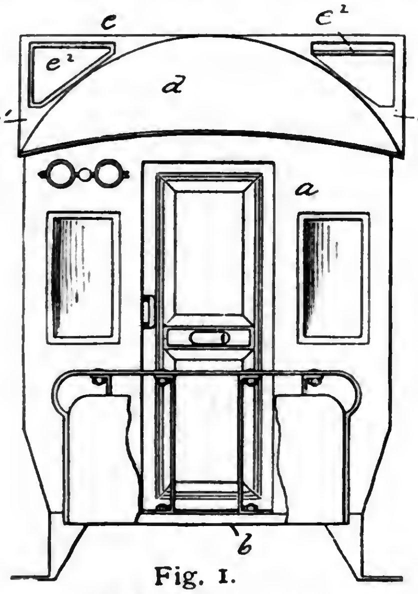


Fig. 1.
STEWART'S STREET-CAR.

a car with parts broken away to illustrate several of the new features; Fig. 3 a view in central vertical section of the car on the plane denoted by the line x x x of Fig. 2; Fig. 4 a view in vertical section through the dash of the car and part of the platform, and Fig. 5 a detail view in elevation of part of the side and roof of the car near the center, showing the side window in the raised roof.

a denotes the car as a whole; *b* the floor of the car, the central portion of which, lengthwise to the car, is formed of planks having in their upper surfaces corrugations *b'*, integral with the floor planks, and *c*, the holding-bars or hand-rails that are secured by brackets *c'*, to each side of the car and run lengthwise to it on about the level of the head of a passenger when standing. These holding-bars are arranged well back from the center of the car, which is left free of all straps or other obstructions. *d* is the roof of the car, which is curved transversely to the car, except for a certain portion *e*, near the center of the car where the roof is nearly flat, which construction leaves the angular projecting parts *e'*, of the roof when the car is viewed from either end. In the vertical walls of this projecting part of the roof, openings are made which are closed by windows e^2 e^3. The windows e^2, are pivoted in

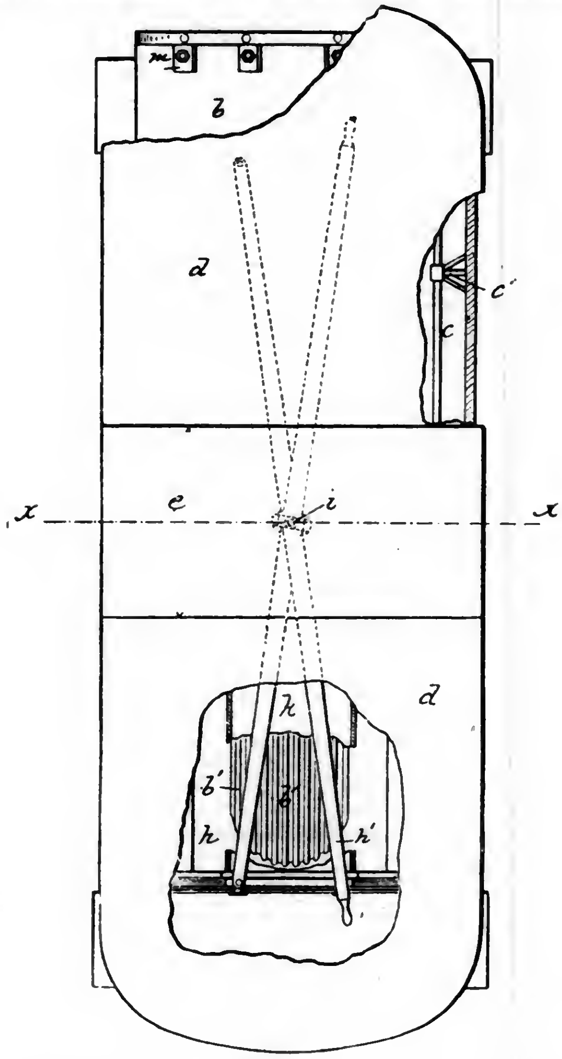


Fig. 2.
STEWART'S STREET-CAR.

the openings and are opened and closed by means of the lever-handles *f*, that are pivoted to the walls and connected by means of a link to the window. The other end of the lever opposite the link, fits in a rack, and when held in the lower one of the sockets the window is closed, as shown on the left in Fig. 3, and when it is in the upper socket the window is held open, as shown on the right in Fig. 3. By opening these windows a steady draft of air is maintained through the top of the car when the latter is in motion, and thorough ventilation thus insured. The side windows e^3, in this raised portion of the roof, may be lettered with the name of the car or its destination.

Each end of the car is provided with sliding doors *g*, hung from the top rail in any ordinary manner, one bracket *g'*, on each door, however, being extended vertically and connected to one end of a lever *h*, which is pivoted to a brace or part of the frame near the center of the car,

the other end of the lever extending out through the opposite end of the car a sufficient distance to enable it to be grasped and operated by a person standing at that end, so as to open or close the further door. Two levers are used and they cross each other at the pivot *i*. These levers *h* and *h'*, by means of the peculiar construction of the socket-pieces, cross each other vertically as well as horizontally, and can therefore be compactly arranged. The box or case *k*, is fastened along the whole length of the car at the center of the ceiling, and covers these levers, and also incloses one or more bells *l*, which may be rung by the passengers by pulling upon the sliding bell-pulls *l'*, that are attached to the car on opposite sides

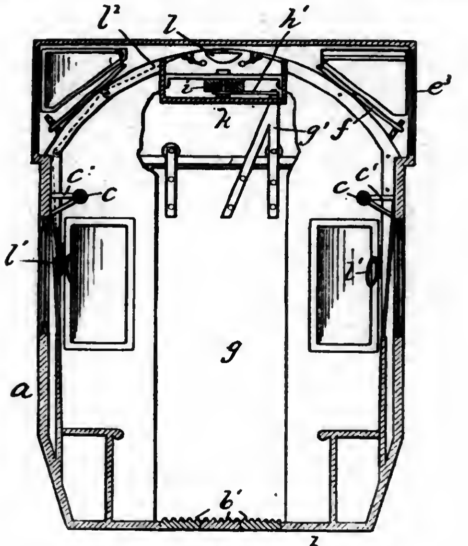


Fig. 3.

STEWART'S STREET-CAR.

and are each connected to the hammer of the bells by means of the wire or cord l^2, that passes over rollers attached to the frame-work of the car.

Each platform is provided with a dash secured to a frame-work that is held in place by means of the flat braces *m*, that are bent at top and bottom at right angles to their length and fastened to the floor and rail *n*, respectively, by means of bolts. The bolt-holes through the top rail may be countersunk on the upper side and the heads of the bolts seated in the countersunk sockets, and the nuts placed below the rail or brace, thus leaving a smooth surface on the upper side of the rail and avoiding the necessity of covering the latter with wood. One special advantage claimed in this improved arrangement

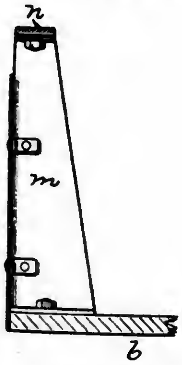


Fig. 4.

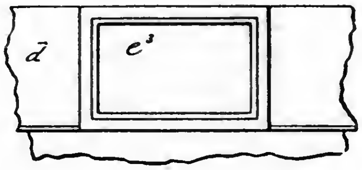


Fig. 5.

STEWART'S STREET-CAR.

of the holding-bars or hand-rails, is that no holding-straps are needed, and the bars are within easy reach of the passengers and afford a holding-brace in a position that prevents them from swaying sidewise in the car when it is in motion. It leaves the central portion of the car more open and adds to the appearance of the car and comfort of the passengers. The hand-rail *c*, is not only so low as to do away with hand-straps, but is so near the side as not to overhang the front edge of the seat, and is preferably directly over the center of the latter, so that there is no chance for it to be in the way of the heads of the passengers using the car, as they naturally lean slightly forward in sitting down and rising, sufficiently to avoid striking the bar.

The flooring of the car is corrugated and these corrugations are not only formed integral with the floor-planks, but are of peculiar shape in cross-section in that there are no corners nor angles in the corrugated part of the floor, the bottoms and sides of the curves and the tops of the projections being all formed in curved planes, as shown in cross-section in Fig. 3. This enables the floor to be readily cleaned, and permits the ready recovery of money or like articles that may be dropped upon the floor.

A street-car of this construction has been in continuous use for nearly one year, and has given satisfaction.

Jones' Rail-Joint.

ROBERT V. JONES, of Cleveland, O., is the inventor of a rail-joint, which is herewith illustrated and described. The invention consists in combining the fish-plate and chair, and is designed to produce a device for firmly holding the contiguous ends of the rails in position, that may be easily and quickly applied or removed.

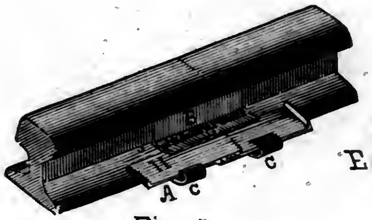


Fig. 1.

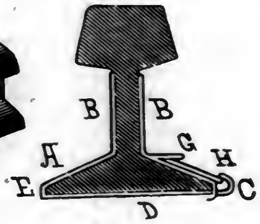


Fig. 2.

JONES' RAIL-JOINT.

In the accompanying cuts, Fig. 1 is a perspective view of the device, and Fig. 2 a view in cross-section.

The joint consists of two plates and a locking-wedge. One of the plates A, rests under the rails and over one side of the flanges thereon, and is continued upward coincident with the web of the rail forming one of the fish-plates B. The other end of the plate A, is provided with tongues C, which catch over the flanges on the side of the rails. A plate D, preferably of less width than the plate A, rests under the plate A, and has an upturned end E, which passes over the edge of the plate A, where it engages over the flanges of the rails. The other end of the plate D, passes upward between the tongues C, and over the flanges of the rails, where it is extended laterally, as shown at F, and has an upward-extending fish-plate. On the portion F, is a longitudinal flange or tongue G. Between the flange G, and the tongues C, rest the locking-

wedge or wedges H. The wedges have notches at the end, and are also there beveled. The other end is upturned, so that it may be easily driven or withdrawn. One end is wider than the other, so that it acts as a wedge. The wedges are driven in from each end till the notched ends of the same engage, they being thinned somewhat, so as to have the necessary spring to cause them to overlap and to disengage them when necessary.

With the device as described, the necessity of drilling holes in the ends of the rails is obviated, as bolts are unnecessary. The plates may be rolled and formed to suit different-sized rails.

The joint can be made of malleable or wrought iron, and it is claimed to be simple and effective, and moderate in cost.

Glynn's Railway-Tie.

Miguel Augustin Glynn, of Havana, Cuba, is the inventor of an improved railway-tie, which is herewith illustrated and described. It is the object of the invention to construct railway-ties of metal for cheapness and durability, and also to make them with means for securing the rails that will allow the removal of one or more ties from the road-bed and their renewal without disturbance to the others or to the rails. To accomplish this end, metallic ties of suitable form are combined with fastening devices that receive and lap over the rail-flanges, the rail-flanges being notched for the purpose.

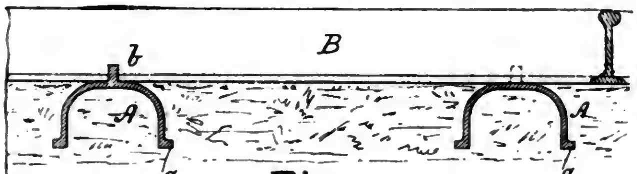


Fig. 1.

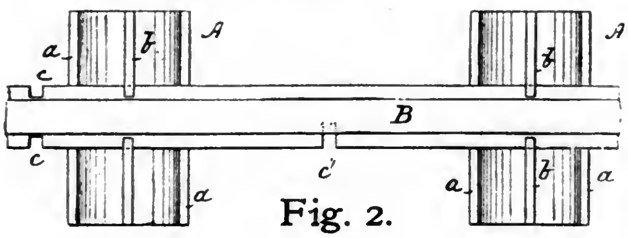


Fig. 2.

GLYNN'S RAILWAY-TIE.

In the accompanying cuts, Fig. 1 is a longitudinal sectional elevation of a railway-bed, showing the improved ties; Fig. 2 a plan view of the same; Fig. 3 a cross-section of the tie in modified form; Fig. 4 a side view of the same; Fig. 5 an end view of the tie constructed for use as a longitudinal sleeper, and Fig. 6 a longitudinal view of the same.

A is the tie, formed of sheet or wrought metal struck up or rolled into the **U** form shown in Figs. 1 and 2, and made with flanges *a*, on its edges extending outward, so as to give a broad bearing, and to prevent the tie from being forced down by weight or pressure. The flanges also prevent, by the weight of the ballast on them, any rising or springing of the tie.

Upon the upper side of the tie are flanges or ribs *b*, that are formed with or attached to the tie by any suitable means, and these flanges are cut or formed to lap upon the flanges of the rail B, so as to hold the latter securely down to place. The flanges of the rail are notched at each side at *c*, or there may be one notch of sufficient length in one flange, as at *c'*, so that the rail can be set down upon the tie, the flanges or fastenings *b*, passing through the notches, and then, by a sidewise movement of the tie, the fastenings *b*, will be locked over the solid portion of the rail-flanges. In Figs. 3 and 4 the tie is in the form of an inverted **T**, with the web slotted at *d*, to receive the rail-flanges in the same manner. In Fig. 5 the tie A, has hook-shaped fingers *b'*, attached by riveting or otherwise, so as to receive the rail between them. In this figure the fastening devices *b'*, are placed to adapt the tie for use as a longitudinal sleeper.

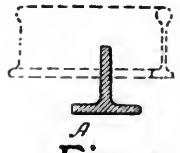


Fig. 3.

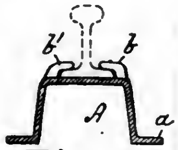


Fig. 5.

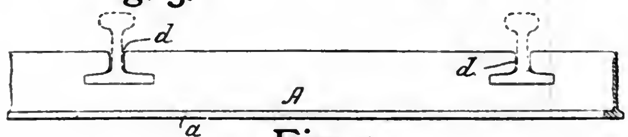


Fig. 4.

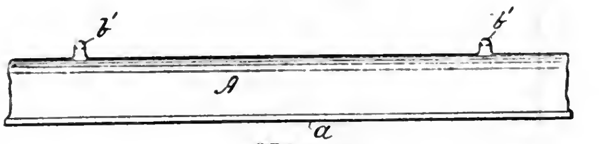


Fig. 6.

GLYNN'S RAILWAY-TIE.

In order to remove a tie from the road-bed, it is only necessary to remove the ballast for a short distance, and then move the tie sidewise until the fastenings are over the notches in the rail-flanges, when the tie can be dropped down and drawn out endwise. A new tie can then be inserted and the whole operation completed without disturbing the rails, and as easily as with wooden ties.

The advantages claimed for this tie are: 1st. The non-requirement of spikes, bolt or screws to secure the rails to place, which is obtained easier and much more safely with the rib clasps here described without the use of any further accessories, whereby a saving of at least four spikes for each tie is gained; 2nd. Doing away with the labor required for the constant revision and adjustment of the spokes or bolts; 3rd. The durability of the metallic tie requiring no demonstration of comparison, and for this reason its greater cheapness in the end; 4th. In point of safety for human life, as well as for the rolling-stock, they are claimed to be preferable, for being made of one single body the rails are so securely adjusted in the clasps that any deviation, even in the sharpest curves, is out of the question, while under the present wood system, with its spikes and bolts, this is the weakest point. It is further claimed that but nine of the transversal ties would be required for every section of 24 feet of track, equivalent to 1,980 ties per mile.

The device is now controlled by J. J. Burnham, care of Grinnell, Minturn & Co., New York City, who is the sole agent.

Worthen's Oil-Can.

CHARLES H. WORTHEN, of Lawrence, Mass., has recently invented a new form of oil-can, which is herewith illustrated and described. The object of the invention is to provide an oil-can or oiler having a device by which limited quantities only of the lubricant are expelled with greater or less force, so that, if desired, it can be thrown some distance from the nozzle or with considerable force into an oil-supply passage, or can be pushed gently therefrom and in a small stream, but continuously, until a large quantity has been fed.

In the accompanying cuts, Fig. 1 is an elevation of the can or oiler; Fig. 2 a vertical central section thereof, and Figs. 3 and 4 detail views.

A represents the body of the cup, B the nozzle, and C a sleeve which extends from the base of the opening of the nozzle downward into the body of the cup. This

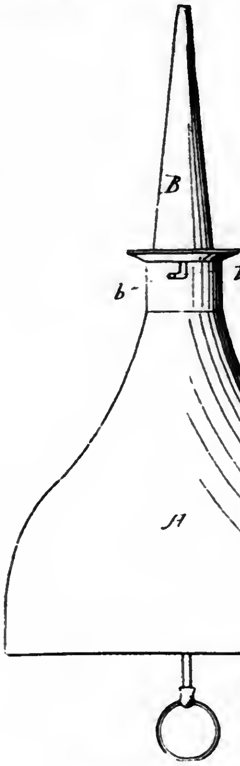


Fig. 1.

WORTHEN'S OIL-CAN.

sleeve has ports or openings *c*, and there is arranged within it a movable sleeve D. There is also arranged to move in this inner sleeve a piston E, which is operated by the stem or rod *e*, which extends downward therefrom through a packing-box F, and through the under surface or bottom of the cup. This piston is so snugly fitted to the sleeve D, (leather cup-packing, as shown, being preferable for the purpose,) that the sleeve is moved upon the movement of the piston until it comes in contact with the inner end of the nozzle-sleeve.

The operation of the device is as follows: The piston and moving sleeve being at their lowest position in the cylindrical casing, to discharge the contents of the cup the piston is moved forward toward the nozzle. This also moves the sliding sleeve, and the movement is continued until the upper edge of the sliding sleeve comes in contact with the shoulder or stop c', when it is stopped and the ports or openings *c*, closed. The movement of the piston, however, is still continued, thereby expelling all the oil or lubricant that is contained in the sleeve into the nozzle. Upon the backward movement of the piston the sleeve is moved with it and the openings or ports *c*, uncovered, thereby allowing the piston to draw into the chamber of the sleeve and casing a supply of oil, and the

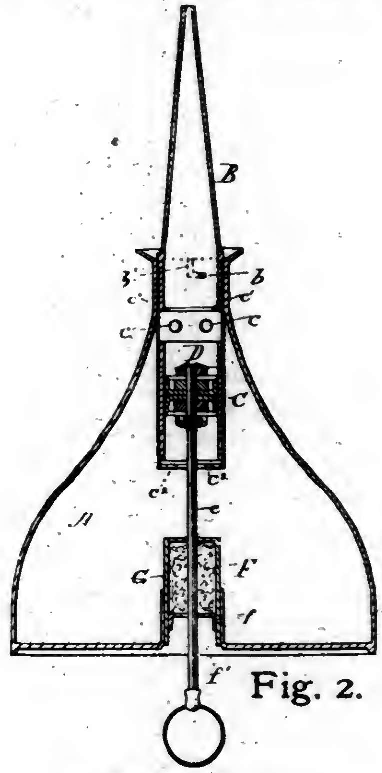


Fig. 2.

WORTHEN'S OIL-CAN.

reverse movement of the sleeve is continued until it strikes the rear shoulder or stop c^2, when it comes to rest, and the reverse movement of the piston is continued until it reaches the end of its reverse throw.

The outer casing or sleeve C, is open at its lower end. It will thus be seen that the quantity of oil or other lubricant is measured and then forced from the measuring-chamber by the movement of the piston with greater or less force and to a greater or less distance from the end of the can, according to the speed of the movement of the piston.

The packing-box is constructed by forming a hole at the bottom of the cup and attaching to the bottom a sleeve G, through which the stem *e*, passes, and in which any suitable packing may be confined by means of the

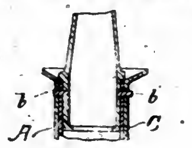


Fig. 3.

Fig. 4.

WORTHEN'S OIL-CAN.

plate or disk *f*, which is attached by solder to the sleeve, leaving a sufficient space f', below, if desired, for the reception of the ring or cap at the end of the piston-spindle. The nozzle of the oiler is preferably fastened to the cup by what is sometimes known as a "bayonet-joint"—that is, by means of pins or projections *b*, extending outward from the nozzle-butt, and bayonet-slots b', formed in the neck of the can or sleeve C. The lower end of the nozzle is adapted to enter the upper end of the

casing, so that when in position its lower edge acts as a stop to the sliding sleeve.

It is claimed that this construction of oil-can is cheap, simple and efficient, and that for medium and large-sized oilers it is very desirable, because it prevents waste, as it is obvious that the cup may be held in any position in oiling, and yet only the quantity which is contained in the cylinder can escape.

The device is now controlled by the inventor and by William O. Webber, of Lawrence, Mass., to whom he has assigned one-half the patent-rights.

Sparling & Fitch's Car-Coupling.

BAZZALLEEL D. SPARLING and PHILIP S. FITCH, of Belmore, O., are the inventors of a new form of car-coupling which is herewith illustrated and described. The object of the invention is to provide improved means for supporting the draw-head; to provide springs to bear against the sides of the draw-head, whereby the draw-head will be allowed to move laterally in turning curves; to provide an improved form of coupling-pin and means for supporting the same, and also improved means for raising the pin to uncouple the cars.

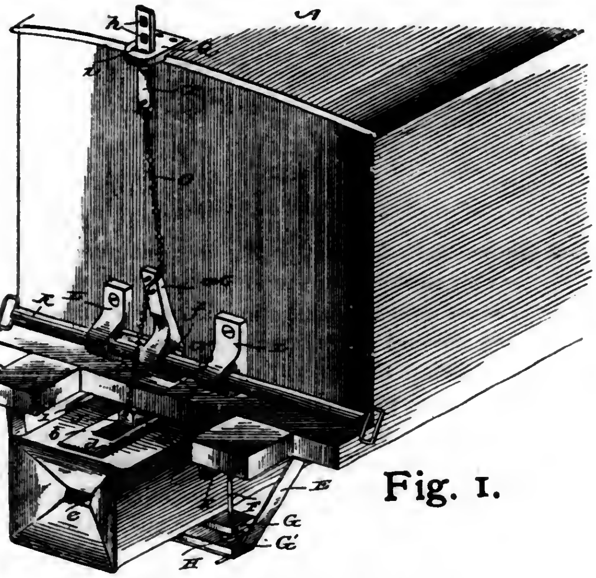


Fig. 1.

SPARLING & FITCH'S CAR-COUPLING.

In the accompanying cuts, Fig. 1 is a perspective view of a car-coupling embodying the invention; Fig. 2 a transverse vertical section of the draw-head, showing the coupling-pin in full lines; Fig. 3 a side elevation, and Fig. 4 a detail view.

A represents a car, to the under side of which is attached a draw-head B. At the rear end of the draw-head is provided an extension C, the end of which passes through a bearing-block attached to the under side of the car, and on this extension, between the rear end of the draw-head and the bearing-block, is a spiral spring, which prevents strain to the car and sudden shocks and jars. E is a bracket, which is secured to the forward end of the car A, this bracket extending under the draw-head, and leaving a space between itself and the bottom and sides of the draw-head. F represents rods located at the forward end of the car on each side of the draw-head. These rods extend downwardly through the bracket E, and upon these rods are plates G G'. Upon the rods between the plates are spiral springs H, holding the plate G, against the under side of the draw-head and the plate G' on the bracket. It will thus be observed that the draw-head is spring-supported at its forward end, and that it will be held in position by these springs, the springs allowing the draw-head to be depressed when coupling with low cars.

Secured to the sides of the draw-head, near the rear ends thereof, are flat springs I, the forward ends of which extend out from the draw-head and bear against the inner side of the rods F. By the employment of these

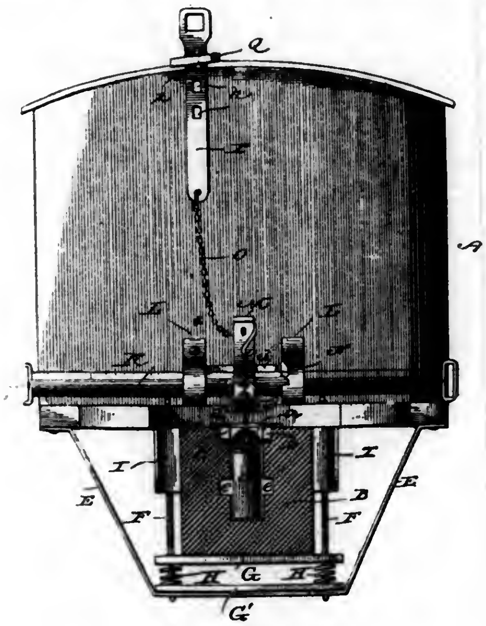


Fig. 2.

SPARLING & FITCH'S CAR-COUPLING.

springs, should the draw-head of an approaching car be out of line, the link of the same will strike the draw-head and force it laterally. The draw-head A, is provided with a pin-opening *a*, which has vertical slots *b*, which are closed at their upper ends by a metal plate *d*. The bottom of the draw-head is provided with an interior groove or channel *e*, in which the lower end of the coupling-pin is adapted to work, this groove or channel terminating near the forward end of the draw-head, so that the pin may be pushed rearwardly, but will be held in a vertical position by the end of the groove. J is the coupling-pin, which is provided with gudgeons located in the vertical slots *b*, in the pin-opening. It will thus be seen that the coupling-pin may swing rearwardly, and can be raised and lowered.

In coupling, the link of the approaching car enters the draw-head and forces the pin rearwardly, the pin dropping over the link and returning to its former position, its end bearing against the front end of the groove or channel in the draw-head, and thus holding the link.

K represents a shaft journaled in brackets L, secured to the front of the car, this shaft being provided at its ends with operating-handles. Upon the shaft K, between the brackets, is provided a spline *f*, which is not quite as long as the distance between the brackets, thus allowing the shaft to be moved laterally. Upon the shaft K, is an arm M, which has a groove to receive the spline, this arm being held against lateral movement by a bracket-stop *g*. The shaft, however, may be moved laterally in the arm.

N represents notches, which are formed on the inner side of one of the brackets L, so that when the shaft is turned to raise or lower the arm M, the arm may be held in such position by sliding the shaft in the arm so that the spline will engage one of the notches. O is a chain which connects the outer end of the arm with the coupling-pin, and which is connected at its upper end with a plate P, having a series of openings *h*, preferably rectangular in form.

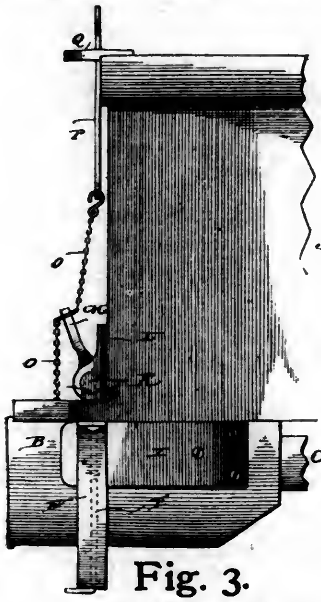


Fig. 3.

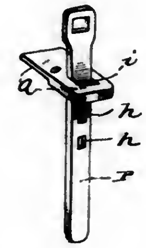


Fig. 4.

SPARLING & FITCH'S CAR-COUPLING.

Secured to the top of the car and extending outwardly therefrom, is a plate Q, having an opening for the passage of the plate P, and extending into this opening is a lug *i*, with which any one of the openings *h*, is adapted to be engaged, thus allowing the coupling-pin to be supported in a raised position from the top of the car. The slot in the plate is smaller than the upper end of the plate P, so that the plate cannot drop through the slot.

This coupling is claimed to be simple in construction, strong, durable and readily applied to any form of car.

Kubler's Permutation Padlock.

JOHN KUBLER, of Hot Springs, Ark., is the inventor of a permutation padlock for freight-car doors and other uses, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a perspective view of the lock closed; Fig. 2 a side view of the same unlocked; Fig. 3 a perspective view of the parts separated; Fig. 4 a section on the line *x x* in Fig. 2; Fig. 5 a section on the line *y y* in Fig. 2, and Fig. 6 a section on the line *z z* in Fig. 5.

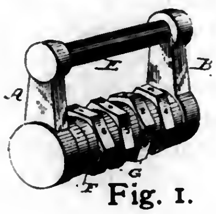


Fig. 1.

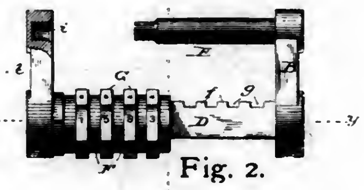


Fig. 2.

KUBLER'S PERMUTATION PADLOCK.

A and B represent two heads, the former being provided with a cylindrical tubular shell C, and the other provided with a notched bolt D, and a stem or bar E, as shown in Figs. 2 and 3. The shell C, is provided with a slot *a*, on its upper side throughout its entire length, this slot being of a width just equal to the width of the slotted bolt D, while within the shell C, slides a circular head or disk *b*, firmly secured to the bolt D. The shell C, is also provided with a series of lugs or studs *c*, shown in Figs. 2 and 5, which serve to hold in place and prevent the turning of the stationary spacing-collars F, which encircle the shell C.

The collars F, as shown in Fig. 3, are provided with two notches or recesses *d* and *d'*, the former to engage the lugs or shoulders *c*, and the other to align itself with the slot *a*, in the shell C. Between the collars F, are the tumblers G, preferably angular on the exterior, and with the interior turned or bored cylindrical to fit the barrel or shell C. These tumblers G, are each provided

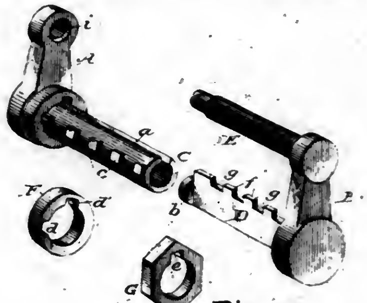


Fig. 3.

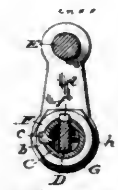


Fig. 4.

KUBLER'S PERMUTATION PADLOCK.

with a notch or recess *e*, of the width of the bolt D, and they are furnished on their exterior with figures and characters, as is usual in this class of locks. The bolt D, as shown in Figs. 2, 3, and 6, is provided with teeth *f*, on its upper face or edge, the teeth being of a width equal to the thickness of the collars F, and separated by notches or spaces *g*, of a width equal to that of the tumblers G. When the lock is closed, as in Fig. 6, the collars F, are directly over the teeth *f*, but the tumblers G, which are between the collars F, coincide with the slots *g*, and can be turned upon the shell C. It will be noticed that the

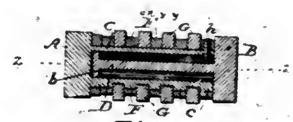


Fig. 5.

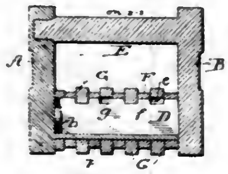


Fig. 6.

KUBLER'S PERMUTATION PADLOCK.

stationary spacing-collars F, each have their slots *d'*, always in a line with the slot *a*, so that when the tumblers G, all have their slots *e*, in line with the slot *a*, the bolt can be slid out lengthwise.

In order to prevent the bolt D, from being withdrawn entirely from the shell or case C, and becoming misplaced or lost, a screw or pin *h*, is provided, which, as shown in Figs. 4 and 5, passes through the outer collar F, and through the shell C, and projects into the latter far enough to prevent the head or disk *b*, from being withdrawn. The screw also serves to hold the tumblers G, and the collars F, in proper position upon the shell C. The bar or stem E, has its end reduced somewhat to fit into a recess or socket *i*, in the head A, though it may be of the same diameter throughout its length.

The collar F, nearest the head A, or the head itself, is provided with a mark, with which certain characters on the tumblers G, must be aligned in order that the slots or

recesses *e*, shall coincide. In the accompanying cuts, the number 1583 is the only one that will allow the lock to be opened, and it will be noticed that each of the figures of this number, 1, 5, 8 and 3, must be aligned with the others and with the marking on the collar F, or the head A, before the lock can be opened. When thus aligned, the recesses *e*, of all the tumblers G, are directly over the slot *a*, of the barrel C, and the bolt can then be withdrawn, the teeth *f*, passing through the notches or recesses *e*. When the bolt is shoved to place it is only necessary to turn the tumblers (one or more) upon the shell C, moving the notches *e*, out of line, and the lock is securely fastened.

The rings or collars F, always occupy a fixed position on the shell C, the upper notches *d'*, being in line with the slot *a*, and held in that position by the lugs *c*, engaging in the notches *d*. By removing the screw *h*, in the end collar the tumblers can be removed and transposed so as to change the combination on which to open the lock. The head B, should be provided with a projecting rim or flange on its inner face, to encircle the end collar and thereby cover and protect the screw *h*, and to prevent tampering with the latter.

The above-described padlock is claimed to be simple and inexpensive, and at the same time efficient and durable.

The device is now controlled by Frank Gross, of Hot Springs, Ark., to whom the patent-rights have been assigned.

Over's Nut-Guard.

EWALD OVER, of Indianapolis, Ind., is the inventor of a nut-guard, which is herewith illustrated and described. The invention principally consists in forming a groove near the point of a bolt and providing a ring adapted to enter the groove, whereby, after a nut is put on the bolt and the ring put in place in the groove, the nut will be prevented from coming off the bolt until the ring is removed.

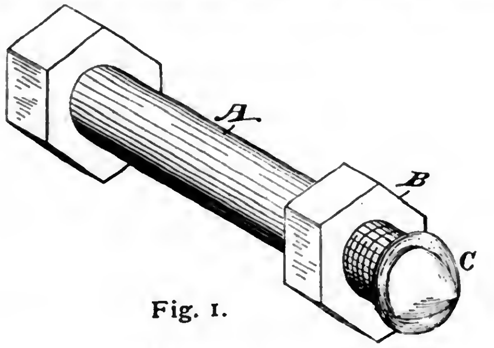


Fig. 1.

OVER'S NUT-GUARD.

In the accompanying cuts, Fig. 1 is a perspective view of a bolt bearing a nut provided with this guard, and Fig. 2 a side elevation of the same, the ring being shown in section.

A represents the bolt, B the nut, and C the ring. The bolt A, is or may be in most respects any ordinary bolt. Near the point it is provided with a circumferential groove *a*, and its point below the groove should be pointed, as shown. It is also preferably reduced in size between the groove and the point, as shown most plainly in Fig. 2, so that there shall be no thread below the groove. The nut B, need have no peculiarities. The ring C, is preferably formed of spring-wire, open, and of a size to fit tightly into the groove *a*, with its periphery projecting beyond the surface of the bolt, so as to prevent the nut from passing over it when in place.

The operation of the device is as follows: The nut is first screwed on the bolt in the ordinary manner. The ring C, is then forced over the pivoted or conical end into the groove *a*, into which it is drawn and held by its inherent

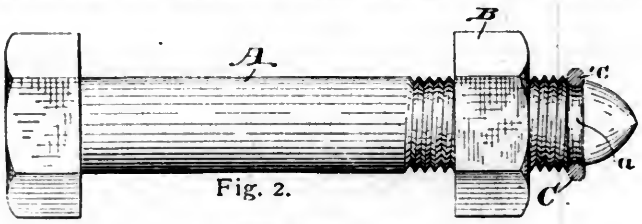


Fig. 2.

OVER'S NUT-GARD.

spring force, thus preventing the nut from coming off. The ring is generally forced into position by the aid of a concave pointed set adapted to fit over the conical point of the bolt.

This device is not intended for a nut-lock, (although it may so serve if the nut comes to just the right point on the bolt,) but simply as a guard to prevent nuts from getting lost. It is claimed to be durable and economical, and to be of use in the construction of railway-cars, thimble-skeins, as well as for many other purposes.

Troy's Nut-Lock.

DANIEL S. TROY, of Montgomery, Ala., is the inventor of a nut-lock, which is herewith illustrated and described. The invention consists of a nut having on its interior face a groove of peculiar form and having the fish-plates or other structure, against which the nut rests, provided with a series of radial grooves, with one of which the groove in the nut registers, forming a receptacle for a soft-metal plug when the nut is screwed in place.

In the accompanying cuts, Fig. 1 is a side view of the fish-plate; Fig. 2 a side view of the nut, and Fig. 3 a section on the line *x x* in Fig. 2.

A is an ordinary nut on one side of which is cut a groove *a*. This groove is preferably made of the form shown in the cuts; that is, narrow and deep at its outside end, and gradually increasing in width and decreasing in depth toward the other end, so that as a plug is driven in it is obliged to conform to the shape of the groove, and it becomes impossible to withdraw it, by reason of its being wider at its inner end. The fish-plate, or other surface against which the nut bears, is provided with a series of radiating grooves surrounding the bolt-hole and extending from the bolt-hole a short distance outward. These radiating grooves are, at the nut-hole, of the same diameter as the grooves in the nut, but they increase in diameter as they recede from the nut-hole, so as to leave the ridges between these radiating grooves of the same diameter from the bolt-hole to the end of the radiating grooves; and these ridges, between the radiating grooves on the fish-bar or other surface, are only half the diameter of the groove in the nut, so that when the nut is screwed down in any position the lower end of the groove in it cannot be entirely closed by one of the ridges between the radiating grooves in the fish-bar or other surface; and there is necessarily an open space leading from the groove in the nut to one or two of the grooves in the fish-bar or other surface, this space being at least equal to half the diameter

of one of the grooves. Through this space the soft-metal plug inserted in the groove in the nut is forced into one or two of the grooves in the fish-bar or other surface. If the nut, when screwed down tight, stops at a point where the groove in the nut coincides with one of the radiating grooves in the fish-bar or other surface, the soft-metal pin driven through the groove in the nut enters the coinciding radiating groove in the opposite surface. If the nut, when screwed down tight, stops at a point where the groove in the nut coincides with one of the ridges in the opposite surface, the end of the soft-metal plug driven through the

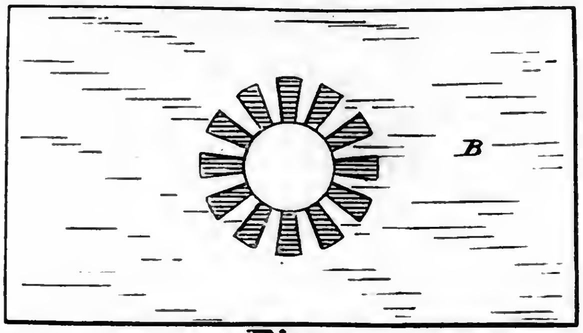


Fig. 1.

TROY'S NUT-LOCK.

groove in the nut is divided by the coincident ridge in the opposite surface and enters the radiating grooves on each side of the ridge against which it is driven. The groove in the nut decreasing in depth toward the bolt-hole causes the inner end of the soft-metal plug, when driven in, to be deflected toward the opposite surface and to enter the radiating grooves, thus locking the nut.

The soft-metal plug is made of the same diameter as the outer end of the groove in the nut, and shaped so as to enter this groove easily. When the nut has been screwed down tight, the soft-metal plug is inserted in the groove in the nut, and by a plunger or other suitable device is driven in by one or more smart blows. Being thus driven, the inner end of the soft-metal plug is forced into one of the radiating grooves in the surface against which the nut rests; or, if the nut has rested where the groove in it is coincident to one of the ridges in the opposite surface, the lower end of the soft-metal plug is divided by the ridge, and the end of the soft-metal plug thus divided is forced into two of the radiating grooves in the opposite surface on each side of the ridge against which it is driven. After the soft-metal plug has been driven in, and its inner end forced into one of the radiating grooves in the opposite surface, the nut cannot be turned backward or forward without shearing off the end of the soft-metal plug, which projects into the radiating grooves in the opposite surface. The groove in the nut is made to increase in width from the edge of the nut to the bolt-hole, so that the soft-metal plug when driven in will spread laterally, and cannot be extracted without removing the nut, and the groove in the nut is made to decrease in depth in the same direction, so as to deflect the inner end of the soft-metal plug toward the opposite surface and into the radiating grooves therein. These radiating grooves or indentations around the bolt-hole in the fish-bar, or other structure against which the nut bears, are of the same width at the bolt-hole as the groove in the nut, and they extend outward from the bolt-hole a distance equal to about twice that width.

The plug is made of any metal which is softer than the material of which the nut is made—preferably lead or copper. When it is desired to remove the nut locked in this way, it is only necessary to apply a wrench and exert sufficient strength to shear off the end of the soft-metal plug which has been driven into the radiating grooves of the opposite surface. The part of the plug remaining in the groove in the nut is no obstacle to unscrewing the nut, and when the nut is taken off the plug can be removed from the groove.

If the nut, by lengthening of the bolt or from other cause, becomes loose, a wrench can be used to screw it up tighter in the usual way. This will, in like manner, shear off the end of the soft-metal plug; but a movement of the nut equal to half the diameter of the groove will bring the inner end of the soft-metal plug opposite an opening into another of the radiating grooves in the opposite surface. The plunger or follower is again inserted in the groove in the nut, and one or two blows force the inner end of the soft-metal plug into new space opened for it, thus locking the nut in its new position; and this may be done from time to time as the nut is screwed up,

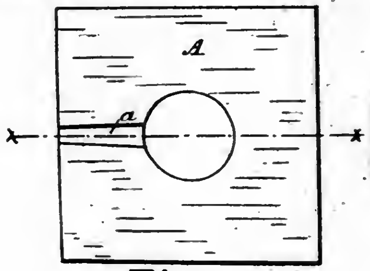


Fig. 2.

Fig. 3.

TROY'S NUT-LOCK.

or until all the radiating grooves in the opposite surface become filled with the sheared-off ends of it. When this occurs, the nut must be taken off, the soft-metal in the grooves brushed out, and when the nut is replaced a new soft-metal plug must be used.

The nut may be provided with any suitable number of grooves for the reception of plugs commensurate with the strain to be imposed upon it, but in ordinary cases one pin has been found sufficient to secure the nut in place.

This nut-lock is claimed to be simple, efficient and economical, and to be especially adapted for railway use.

Waite's Packing for Axle-Boxes.

ENOCH WAITE, of Franklin, Mass., is the inventor of a new form of packing for axle-boxes, which is herewith illustrated and described. The invention is especially adapted to car-axle bearings, although it may be conveniently applied to other bearings. For the purpose of keeping car-axles oiled, the boxes are at present commonly filled with wooden waste or similiar material composed of loose fibers or threads, which is saturated with oil and tightly packed into the box. This waste is not, however, always clean, but frequently contains sand and dirt, which cuts the bearing, and has an injurious effect. It is also difficult to get out quickly in case the box becomes heated, and trains are often delayed for this reason; and it is further imperfect in its working, being liable to sag down in the box so as not to touch the axle, but allow it to heat, while separate threads in some cases get

wound around the axle, and are liable to ignite and set the box on fire. The object of this invention is to secure a stuffing or packing which shall supply oil in sufficient quantities to the bearing and yet be free from these objectionable features.

In the accompanying cuts, Fig. 1 shows a quantity of packing strung together in the manner in which it is preferred to prepare it for use in car-axle boxes; Fig. 2 is a modified form, and Fig. 3 a section of a car-axle box packed with the improved lubricant-packing.

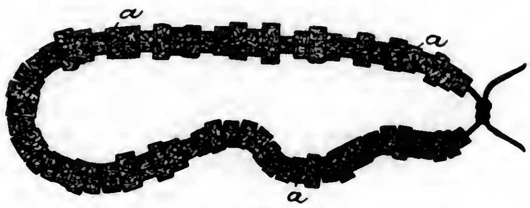


Fig. 1.
WAITE'S PACKING FOR AXLE-BOXES.

In preparing the improved packing it is preferred to use a felt fabric, made chiefly from wool and hair, lightly felted, and of considerable thickness—say from an inch to two inches—although the precise thickness is not material. This is cut into small pieces *a*, as in Fig. 1, or into strips, as in Fig. 2, of convenient size to be crowded in a crumpled or irregular shape into the box; and for convenience in handling the small pieces *a*, they are strung on cord or flexible wire, as in Fig. 1, making the strings of sufficient length so that not more than two or three of them will be required to pack a box. The stringing of the pieces does not interfere with the efficiency of the packing, while in case it is desired to remove it from the box for any reason, a string may pulled out at a time, thus emptying the box very speedily, which is of consideralbe importance. This method of handling it is also of like importance in repacking the box speedily.

In car-axle boxes the vehicle or packing for supplying the lubricant to the bearing occupies a space within the box A, as in Fig. 3, below the axle B; and for the greatest efficiency the packing should be springy or resilient, in order to press up against the axle, and not of a character

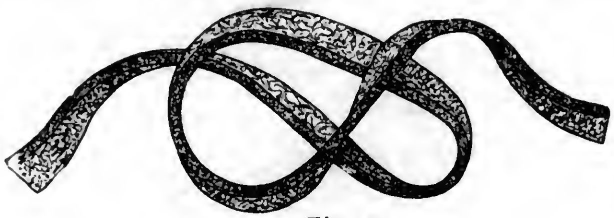


Fig. 2.
WAITE'S PACKING FOR AXLE-BOXES.

to solidify or mat down and thus fall clear of the axle. This resiliency is obtained in large degree in felt of the kind above mentioned, in which the hair fibers (as also those of wool to a lesser extent) are springy and tend to resist compression. By crowding the resilient packing into the lubricant-chambers of the bearings in a crumpled or irregular shape it is claimed that it will not become matted down as the ordinary packing does, but will keep in constant contact with the journals to lubricate them in an effectual manner at all times.

One of the chief advantages claimed for this packing is the great speed with which a box can be emptied and repacked, owing to the method of stringing or cutting the pieces. This advantage may be obtained and a packing of considerable efficiency produced by the use of pieces of woven fabric of good absorbent qualities, particularly if these are cut from a sheet made up of several layers of

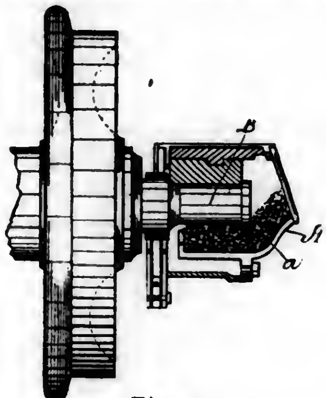


Fig. 3.
WAITE'S PACKING FOR AXLE-BOXES.

woven fabric secured together, so as when cut to give pieces of considerable thickness.

This packing has now been in daily use for six months, with but one oiling.

Herschell's Locomotive-Spring.

JOHN T. HERSCHELL, of Evansville, Ind., is the inventor of a spring especially adapted for locomotives, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a side elevation of one of the side frames of a locomotive, which carries the bearings for the drive-wheel axles, with the invention applied thereto; Fig. 2 a side elevation of the front truck of a locomotive, showing the preferable manner of applying the improved spring thereto; Fig. 3 a similar view of a

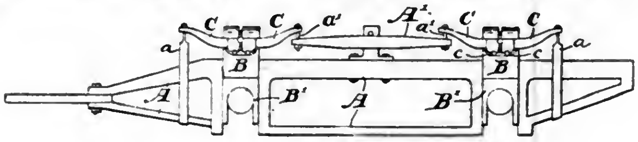


Fig. 1.
HERSCHELL'S LOCOMOTIVE-SPRING.

tender-truck, showing the invention applied thereto in the preferable manner; Fig. 4 a top or plan view of the spring separately; Fig. 5 a side elevation of the same; Fig. 6 a central longitudinal section through the same on the dotted line *z z*, and Fig. 7 a transverse sectional view, looking to the right from the dotted line *y y*.

The portions marked A, represent the several frames, shown to illustrate the various modes of applying the spring when used in different places; B the spring-saddle; C the arms, or arm portions of the spring; D a coiled metal spring; E a rubber spring; F a rod running through the parts containing the rubber spring and securing the two sides or arms together, and G a pivot-bolt interposed between the ends of the arms.

The frames A, of the several trucks are shown only to illustrate the preferable manner of attaching the spring to the different forms of trucks, and form no part of the invention. Fig. 1 shows the springs resting on the saddles, which in turn rest on the axle-boxes B′, the outer end of each spring being secured to the frame by a strap *a*, and the inner ends being connected to an equalizing-bar A′, by straps *a*′. On the truck shown in Fig. 2, the spring is

shown inverted, the outer end of each arm being connected to a bar A^2, by the straps *a*, the ends of this bar being secured on the axles of the truck, as shown. The saddle B, rests upon the central portion and supports the frame. On the truck shown in Fig. 3, the spring is applied in a similar manner to that shown in Fig. 2, except that the arms themselves are extended out and are secured to the axle-boxes B′, instead of being secured to a cross-bar, and the saddle B, is inserted in a "pocket" in the frame-

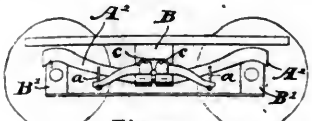


Fig. 2.

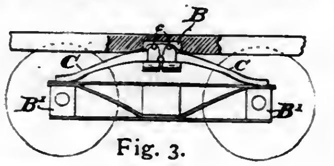


Fig. 3.

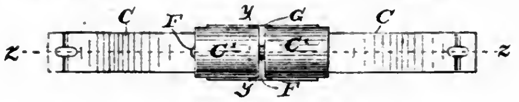


Fig. 4.

HERSCHELL'S LOCOMOTIVE-SPRING.

work. The saddle B, in which the central portion of the spring rests, is secured to the proper part of the frame in any suitable and convenient manner, and is formed to receive the central portion of the spring, as shown, and form a bearing therefor.

The arms C, are made of malleable iron and are formed with hollow upwardly-extended portions C′, in their adjacent ends, the outer ends of which are open and the adjacent ends of which are closed, with only a hole *c′*, large enough to accommodate the bolt or rod F, which passes through them. The openings in these parts are preferably formed cylindrical, and, as shown, may be filled with the rubber springs E, but experiments have demonstrated the superiority of steel coil-springs for the purpose. The lower adjacent corners of these arms are extended down somewhat, and the inner ends thereof are thus enlarged,

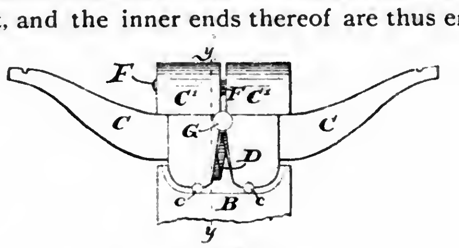


Fig. 5.

HERSCHELL'S LOCOMOTIVE-SPRING.

as shown. An opening or seat C^2, is formed in each of the adjacent ends, near the lower corner, in which the coiled spring D, is inserted. An anti-friction roller *c*, is mounted in a suitable bearing on the upper side of each arm between it and the spring-saddle, thus securing mobility of operation. Midway between the openings for the rubber and the coiled springs in the arms a transverse semi-circular notch is formed in each of the adjacent ends, in which, when the several parts are in working position, the pivot-bolt G, is mounted. The coiled spring D, is preferably of steel, and is of appropriate strength for the use designed. It is inserted, as before indicated, between the ends of the arms, one end resting in each of the openings or seats C^2, in the ends.

The bolt F, is any suitable bolt of the required length and size, and is inserted through the longitudinal holes of the rubber springs in the parts C′, the head of the bolt bearing against the metal follower on the outer end of one of the springs, and the nut thereof bearing against the follower on the outer end of the other spring, as shown and before described, and thus secures the two parts of the spring together. The pivot-pin G, is placed between the ends of the arms, one side resting in each of the notches therein, and thus forms a fulcrum over which each of the arms operates when the spring is in use.

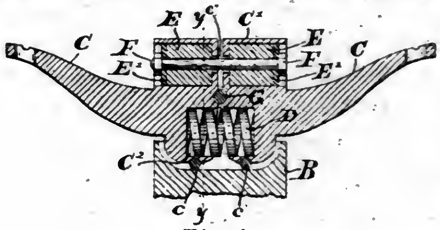


Fig. 6.

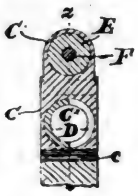


Fig. 7.

HERSCHELL'S LOCOMOTIVE-SPRING.

The several parts are secured in position and together, as shown, the bolt F, holding the two parts together at the top, the pin G, being interposed between the ends of the arms for a fulcrum, and the spring D, being interposed between these ends below the fulcrum, to operate in conjunction with the spring to support the arms. The device being then mounted on the truck, between the weight and the truck or the supporting frame-work, it operates as follows: The spring being in the position shown in Fig. 1, the weight operates to bear down the ends of the arms, which operate over the fulcrum G, and, through the bolt F, and followers E′, compress the springs E, on one side of the fulcrum, and bears the adjacent lower portions of the arms toward each other, and thus acts upon the spring D. The weight being lessened or removed, these springs expand and bear the ends of the arms upward again. When the spring is inverted, as shown in Figs. 2 and 3, the weight bears the center of the spring down, instead of the arms, the effect of which upon the other part of the device is the same as described.

This spring is claimed to be strong, durable and efficient, and has been subjected to a thorough test, operating satisfactorily on a locomotive running 16,522 miles.

Haigh's Automatic Boiler-Feeder.

SAMUEL HAIGH, of Coquitlam, New Westminster, British Columbia, is the inventor of an automatic boiler-feeder, which is herewith illustrated and described. In the accompanying cuts on the following page, Fig. 1 is a sectional elevation of the boiler-feeder; Fig. 2 an elevation of the apparatus, partly sectional, showing also the connection to the boiler and to the condenser, and Fig. 3 a detail view.

The two vertical water-cylinders A A, are placed contiguously in any convenient situation; but the bottom of the cylinders should be slightly below the water-level of the boiler to be fed. In each cylinder is a float B, of substantial character, and these floats should be braced internally to prevent their collapse under the steam-pressure. The floats are loose upon the rods *a*, that are stepped in the lower heads of the cylinder and extend through stuffing-glands in the upper heads, up to the pivoted beam *b*, to the opposite ends of which the rods *a*, are connected by jointed links.

Between the two cylinders A A, is a steam-chest C, supplied with steam from the boiler and containing a slide-valve *d*, fitted to move on a seat which has two steam-ports *e e*, leading to the cylinders A A, and an exhaust-opening *f*, that connects by a pipe *g*, to a con-

denser D. An arch rising from the chest C, supports the steam-cylinder E, with its valve-chest *h*; and a head *i*, in the cylinder E, is upon the rod *k*, that extends downward and is connected to the valve *d*, in the chest C. A valve *t*, in the chest *h*, is connected by a rod to the beam *b*, and works in connection with simple parts to admit steam to opposite sides of the head *i*, alternately. The rod *k*, passes through a guide-bar *l*, and has upon it collars *m m*, which, coming in contact with rubber buffers *n*, on the guide-bar, limit the movement of the rod.

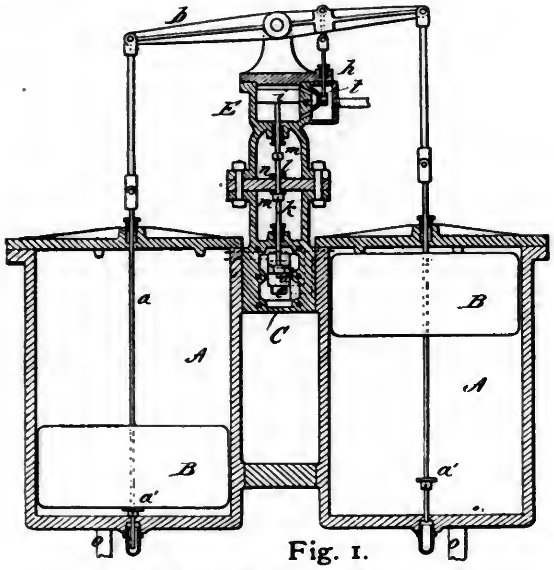


Fig. 1.

HAIGH'S AUTOMATIC BOILER-FEEDER.

The water-cylinders A A, have each a pipe *o*, connected in their lower heads for inlet of water from an elevated supply, and also for outlet of the water to the boiler. The arrangement of the connections, as shown in Figs. 2 and 3, is as follows: The pipe *p*, to the boiler and pipe *q*, from the feed-tank connect by the two cross-pipes *r r*, at opposite sides of the T's *s s*, by which the pipes *p q*, connect to the cylinders A A. *u u u u* are check-valves in the pipes *p* and *q*, and the pipe *q*, is shown as connected to the condenser D, so as to utilize the heat of the exhaust for warming the feed-water.

The operation of the device is as follows: A stop-cock in the pipe *q*, from the feed-tank being opened, the water fills the cylinder A, that is not open to the boiler, the other cylinder being already filled. As the water-level in the boiler lowers, the water in the cylinder that is open to the boiler by one port *e*, will be gradually run out until the float B, falling, comes in contact with a collar *a'*, on

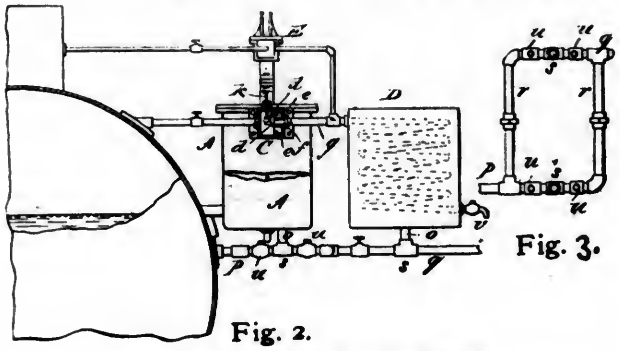


Fig. 3.

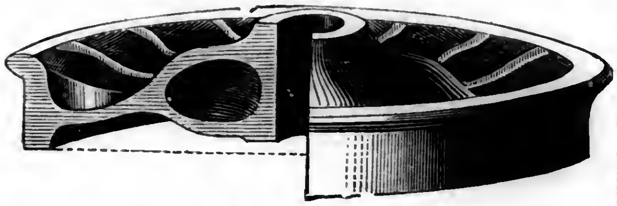
Fig. 2.

HAIGH'S AUTOMATIC BOILER-FEEDER.

the rod *a*, and its weight, carrying the rod down, moves the beam *b*, so that the valve *t*, is shifted, and steam being thereby admitted to the cylinder E, acts on the head *i*, to move the rod *k*, and shift the valve *d*, thus closing one port *e*, and by opening the other port *e*, steam is let into the filled water-cylinder, which will empty as soon as the pressure is equalized. The steam in the cylinder just emptied of water now exhausts into the condenser D, and the vacuum created in the cylinder starts the flow of water, so that it again refills. This operation continues so long as the supply of water continues from the tank or other source.

The condenser may be of any suitable form. A simple coil in a tank is shown, and its drip-cock *v*, is provided with a check-valve, so as to prevent destruction of the vacuum formed in the water-cylinders. When the supply of feed-water is overhead, the condenser D, is not required, the condensing coil, with its drip-cock and check-valve, being placed in the overhead tank. The condenser D, is only used when it is required that the feeder shall lift the water from below the level of the boiler.

Ramapo Wheel and Foundry Company.



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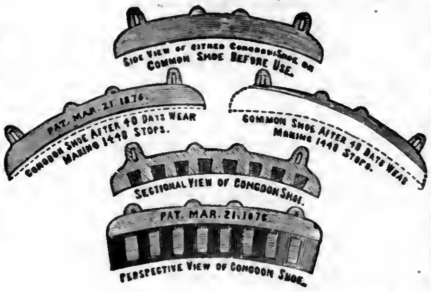

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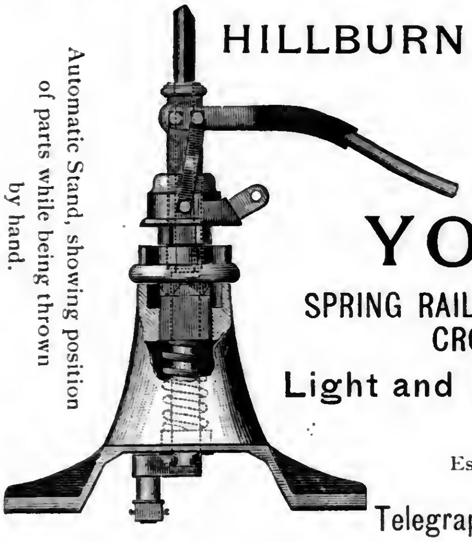

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American Railroad Journal.

WHOLE No. 2,570.] NEW YORK, NOVEMBER, 1885. [VOLUME LIX.—No. 8.

CURIOUS CARS FOR FREIGHT-TRAFFIC.

BY F. B. BROCK.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT is not the intention of the writer to indulge in a strain of invective against the patented appliances for freight-cars. Far from it. The freight-car in universal use upon our roads to-day is the subject of several patents, although the most important of them have long since expired and become public property. The entire equipment of railway engineering is a testimonial to the genius and perseverance of American inventors.

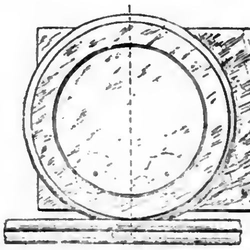

Fig. 1.

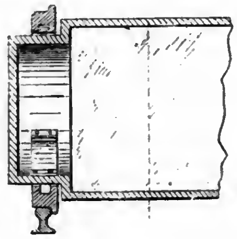

Fig. 2.

But among the hosts of patented freight-cars—some meritorious, and some of indifferent merit—there has appeared a fungus growth, for which the world has, as yet, found no commercial use, but which may find a place, for ought we know, in the progressive science of the future. Instances of these sporadic cases of inventive ingenuity are freight-cars, the excessive iron-work frames of which remind one of a section of the Coney Island pier, or one of Eads' structures spanning the Mississippi. Then, again, an inventor wants to overcome, to the utmost extent, "the great centrifugal force manifested in the turning of curves," and to "supersede the faulty and manifestly objectionable car mounted above a narrow pair of trucks, which are so readily overturned." The first object is worthy enough, but railway engineers seem to be unanimously of the opinion that a car mounted upon "a narrow pair of trucks" is good enough for them.

To remedy the "objections" indicated above, this particular inventor devised a freight-car, the points of excellence of which will be better gleaned by the reader from an illustration or two (Figs. 1 and 2, the former being a side elevation, the end of the car being broken away, and the latter a transverse section of the same).

This car is composed of a rectangular box, the center of gravity of which is low enough to satisfy any one. The car runs upon four annular or ring-shaped wheels. Overgrown journals or circular bosses project from the sides of the car. The interiors of these cylinders, on which the annular wheels bear, are recessed in order to enlarge the storage capacity of the car. The underside of the car is brought but a few inches above the rails. Anti-friction rolls are interposed between the journals and wheels. An interior circumferential groove is cut in the annular wheels, in which runs both the anti-friction bearing-roll and also a horizontal anti-friction wheel, arranged on top of the journal-bearing, for the purpose, it is said, of relieving the wheels from undue lateral strain. In short, the inventor wants "to do away with the ordinary car-trucks and wheel, and their attendant expense." Moreover, he wishes to bring the center of gravity down to the lowest extent; and he has done it, though, perhaps the reader may think, at the expense of some other valuable points.

Coal-cars also come in for their share of "improvement." They are made of various unnecessarily expensive shapes, and some are provided with elaborately designed "hatches"—to use a nautical term—for keeping out rain and snow in transit.

Grain-cars are not only made cylindrical, but with an interior double wall, both of iron, with wide air-spaces between for ventilation.

Various freight-cars have their frame-work made of tubular iron, while one in particular provides for a freight-car frame upon the telescopic principle. The main framing consists of large telescopic tube sections at top and bottom on both sides of the car. Springs of spiral form are interposed within the tubes to form a cushioned resistance in case of accident. Tubes also compose the truck-frames, which are connected to the wheels themselves in such a manner that the whole car will slide forward over its trucks for a given distance, upon the attempt, for instance, of another train to pass by on the same track.

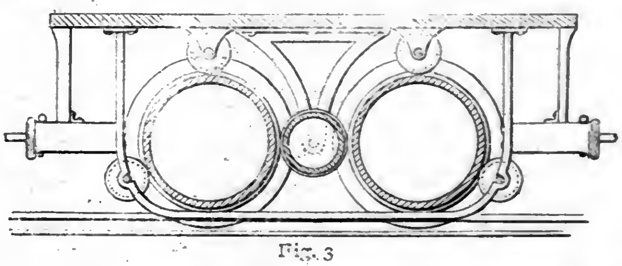

Fig. 3

The rolling-barrel idea seems to be a favorite one with the inventive aspirant. He has ever in mind economy of space and the lowering of the center of gravity. In Fig. 3 (a longitudinal sectional view) are shown two cylindrical barrels laid transversely upon the track, and provided with flanged tires corresponding to the gauge. These cylinders are kept apart with respect to each other by an encompassing cage, giving each barrel three rolling points of contact. This cage supports a platform and a coupling-head at each end. One of the rolling-bearings is common to both barrels, and is itself a carrier of merchandise. It is made hollow for that purpose. It is swung in position by brackets depending from the underside of the

platform. The immediate support of the latter is obtain- by the upper rolling-bearings, and the endwise jars or strains are taken up by the central revolving carrier and the lower roller-bearings, which are swung below the axial lines of the main carrying-barrels, The carriers under way are constantly under a high degree of revolution. The inventor states that these bearings may be oiled equally well when the freight-car is in motion, but does not tell the quantity of oil necessary to keep them in proper condition, nor what means are provided to neutralize the law of centrifugal motion when oiling.

While we are on this branch of the subject let us look at one or two other types of revolving freight-cars, any one of which, if adopted, would certainly work a *revolution* in freight-traffic. A transverse elevation of a style of this car is shown in Fig. 4.

A peculiar construction is given to the wheels so as to give an elastic support, thereby, it is claimed, taking up the shock and reducing the wear and tear of the rolling-stock and track. For this purpose the wheels are made with a cast-iron central portion and a wrought-iron rim or tire. The periphery of the cast-iron portion is enlarged laterally, and formed with a lateral groove having recesses at intervals for the reception of bearing-springs of steel or rubber. Surrounding the springs are felloes of wood, held in place by a circular metal-band. The wrought-iron tire is applied while heated and cooled by minute jets of water, so as to be shrunk on uniformly. The wooden felloes serve, it is said, to protect the springs against injurious action from heat while the tire is being shrunk on, and also to impart additional elasticity to the wheel when in use. The conoidal form of the car-body, sloping from the wheels downward, or flaring toward the medial band, facilitates the discharge of such freight as grain through the central peripheral openings.

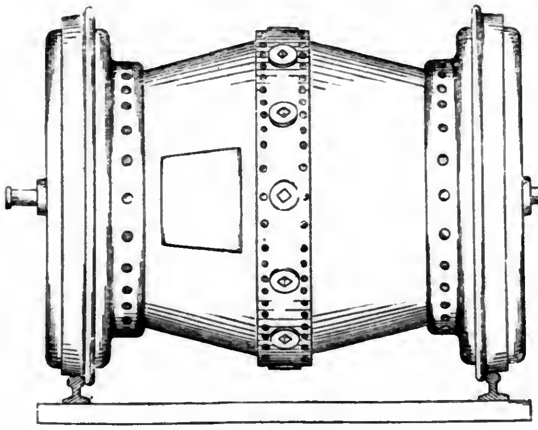

Fig. 4.

The inventor is silent as to the frictional generation of heat from the agitation of grain in such conveyances. While the car might escape without a hot-box, how about hot grain?

Another instance of this genius of invention comprises two rolling flanged barrels arranged within a truck-frame of skeleton form, with a central longitudinal board, elevated upon a converging frame-work, for the passage of the train-hands along the length of the train. The cylinders have perforated ventilating pipes passing endwise through them, and also perforated partition-plates therein to prevent the load from shifting.

In Fig. 5, we have a unique style of freight-car, which is adapted, the inventor says, "more especially to cars adapted for use on triple-rail tracks." It requires no exhaustive treatment of the advantages of this system to be here set forth. What merits it has may be evolved from a glance at the illustration. "Triple-rail tracks!" Methinks the phrase has a pleasant sound.

There are many other curious freight-cars which have been patented, but I will not take up the JOURNAL'S space beyond the illustrations given. There is just one other device, however, of which I would like to speak—a patented process for loading flat freight-cars. The inventor applies this process in loading a flat car with baled hay. Scantlings are stuck in between the bales upon which other bales are to be hung. These projecting bales are built out from the side of the truck, so as to take up the path of the adjacent trucks. The inventor neglected to tell us how these bales were unloaded again, but as there are many obvious methods perhaps he did not think it necessary. For instance, any way-station house would scrape off the projecting bales, and probably most of the others with them. Or they could be unloaded at very short notice by meeting a train on the adjacent track, or by passing empty cars on any of the side-tracks along the route.

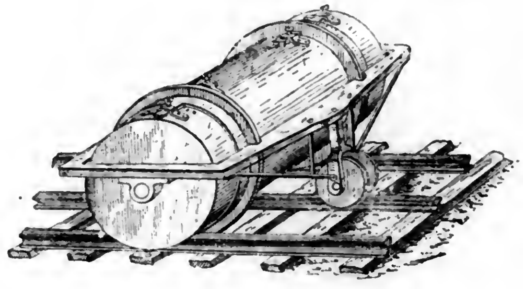

Fig. 5.

ACCIDENTS AT OVERHEAD BRIDGES, HIGHWAY-CROSSINGS AND PERMANENT WAY.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

In treating of railway accidents in a general way, it is hardly worth while to indulge largely in any unprofitable speculations, or devote time and space to that class of accidents which may be called non-preventable, or charged to "dispensation of Providence." Accidents of some kinds will happen in spite of all precautions taken to prevent them; but killing people at overhead bridges is not one of this class. A writer on railway construction says, in a recent article, that accidents of the kind under consideration are more frequent than formerly and gives directions for their precaution. "Freight-cars," he says, "are built higher than formerly, some of them being 14 feet from the top of the rail to the top of the car, and overhead bridges should have a clear space of 20 feet from the rail." Now there are hundreds of trainmen and others who ride on the top of freight-trains that are just tall enough to be scalped by a 20-foot bridge while standing on a 14-foot car, so that, as a measure of safety, officials must either employ shorter trainmen, or build higher bridges, or

lower cars. A bridge 20 feet high might ordinarily be considered safe, as it is only occasionally that a 14-foot car is in a train, and common prudence or foresight would suggest that the "deck-passenger" would find a place on the lower cars especially when passing under bridges. But there are divers reasons why some one might be on the high car just at the time of reaching the bridge, and that particular person is very liable to be a little over six feet in stature. Or perhaps the bridge was built 20 feet above the rail, but track repairs frequently necessitate a raise of several inches, and the bridge not being correspondingly raised soon finds a victim. Several devices are in use to give warning at such bridges but they frequently fail, and the only real safety lies in *being sure that the structures are high enough.* In some localities it is a matter of more or less expense and inconvenience to get a safe height, but a failure to do this is frequently expensive and otherwise unpleasant, and when a height of 20 feet may be regarded as *pretty near safe*, it would not be very expensive or troublesome to make it 21 feet. The last foot would save life to trainmen and ready cash to the companies. "Through bridges," or what are known as covered bridges are often found too low, the roof being too near the rail to allow of even a man of low stature to stand erect and go through with safety. It is a matter of economy to cover wooden bridges to prevent decay. The sides are tightly boarded and painted, and in some parts of the country the roofs are shingled, but the most common covering is slate. Many beams and other timbers are unnecessarily low, and of no earthly use but to kill people and stand as specimens of engineering stupidity.

It is not accurately known how many have been killed in the United States by these bridges, but the list is a long one. In Massachusetts, in the year ending September 30th, 1883, 14 accidents are reported. In hilly and thickly populated sections there are more of these structures than in level districts where crossings are mostly at grade. Probably New England and the middle states have more of those structures than any other parts, and it is not easy to base an estimate of the whole on a New England report. But this is a kind of accident for which there is no excuse, save the exercise of too much of the same kind of economy that destroys life through many other preventable causes; and if there is an overhead or through bridge on this continent, or anywhere else, that is not known to be absolutely safe it should receive attention at once. There is a plenty of room above and below for safety, and no extra taxes for using it.

Another class of accidents which cause much trouble and brings many to grief or the grave is the deadly road-crossing. There is scarcely anything more dreadful in the line of railway disasters than the frequent collisions of trains with carriages at grade-crossings. The causes of such accidents are various and somewhat peculiar in their nature, and although many of them may be removed, it can hardly be said that all the causes can be annihilated and crossing a railway at grade rendered absolutely safe. The causes, either remote or direct, that lead to these accidents are not always under the control of either the railway operatives or the highway travelers, and to assert that there is no excuse for grade collisions would be out of reason. It has formerly been the custom of the press to characterize these mishaps as "the latest railway murder," and charge the officials with criminal neglect and assert that they alone should bear the blame. In many instances of serious disasters of this kind there are evidences of a lack of thorough management, but it is true that the general management has made strong efforts to reduce the frequency of this class of accidents. Flagmen are kept constantly at dangerous points, gates are provided, automatic-signals to give warning by day or night, the bells and whistles of locomotives and the best power-brakes are employed to prevent these mishaps—and yet they are frequent. Certainly the railways have done nobly in this matter and it remains for the trespassers, who are the victims, to stand the blame in most cases of injury. People are careless, and pay no attention to the warnings and suffer death for their foolishness, and their friends collect damages in large sums. People argue that it is not they who must look to their own personal safety, but the railways—having many or all the favors they ask of the public, and waxing rich by serving the public—must, perforce, guarantee the safety of all who may trespass on the right-of-way at all times and places, and under all circumstances, whether necessary or otherwise; and whether deaf, dumb, blind, sound or cripple, on foot or in a carriage, or *à la cheval*, drunk or sober, day or night; on board a train, or trespassing by walking or driving on the permament way, or in a waiting-room; whether riding on a pass or paying fare—in fact in every case, the railways are considered by a very large share of the unreasonable public to be responsible for any injury persons may receive, no matter how much or how far the unfortunate may be out of his or her proper place. They reason after the manner of the Hibernian, who was on shipboard in a gale. When some expressed fears that they would all go to the bottom he said, "Be gad! I paid the captain to take me across and I'll make him stick to the bargain." If they lose a limb or their lives through their own stupidity the company must pay for it.

But seriously, the railways have done their duty, as a rule, in the matter of safety at grade-crossings, and if the public will do as well and exercise a reasonable amount of caution, and act on the principle that "self-preservation is the first law of nature," there will be less slaughter at these crossings. The only means of absolute safety lie in making *all highway or street-crossings either above or below grade.* Although this is not an impossibility it is impracticable, which leaves the matter in a shape for legislation. The railways need a little of it to make them more particular in the enforcement of orders. Aside from the safety appliances that have been supplied to keep people off the track in times of danger, the bell and whisle are ordered to be sounded. Enginemen frequently neglect this, and as no notice is taken of it by their superiors the habit becomes chronic and causes much trouble. Nearly all roads are strict enough in their orders to ensure safety, but are not rigid enough in their enforcement of these orders. For this there is a remedy. Then let the public understand that they must observe certain rules which shall be prescribed, and crossings can be made comparatively safe.

As an instance of the difficulties experienced by railway men in enforcing trespassers to observe the rules for safety, another quotation from the Massachusetts commissioners' report is offered. For the same year above quoted, 93 trespassers were killed and 54 injured; 112 were

on the track, and 33 in the cars *unlawfully*. Killed at highway crossings, 15; injured, 29; whole number, 44. Killed or injured at crossings guarded with gates or flagmen, 18; not so guarded, 21. This shows that some people are fond of getting into danger, and perhaps the best measures of safety that can be recommended for these very unfortunate people would be to discharge the flagmen and remove the gates. When people have learned to appreciate the efforts of officials in their behalf there will be less cause for styling railway men wilful murderers, and less grief in the land.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

II. THE NORTHERN PACIFIC AND THE ATLANTIC AND PACIFIC RAILWAYS.

ON the Northern Pacific Railway the medical service is organized as a mutual benefit association. All officers and employés of the company are required to be contributing members, except those whose monthly pay is less than $25. The board of managers consists of three representatives from each of the operating divisions, one elected by employés of the transportation department, one by those of the road department, and one by those of the machinery department. To these are added a number, equal to thirty per cent. of the whole, chosen by the general manager, who also serves *ex-officio*. The members and officers of the board of managers serve without pay, except the secretary, who is the executive officer.

The medical staff consists of one chief surgeon, hospital surgeons, division and local surgeons. The chief and the hospital surgeons receive salaries from the association fund. The others are paid according to a settled fee-bill, or by passes over the road.

Members whose monthly pay is $25 or over and less than $100 contribute fifty cents per month to the fund; those receiving $100 or over and less than $200 contribute one dollar per month; those receiving $200 and over contribute two dollars per month. These dues are deducted from their monthly pay,

The benefits of the association are as follows: In case of sickness or injury the member is entitled to attendance by the medical staff, to medicines, and to maintenance in hospital provided the case disables him for work. He is also entitled to an allowance of fifty cents for every working-day so lost, counting after the sixth day of disability. Should the disability last more than six months, the allowance is reduced one-half. When the injury or sickness arises from other cause than accident in discharge of duty, this money allowance shall continue not more than one year. Attendance and medicines are also supplied at the houses of members, who reside within a convenient distance of a surgeon employed by the association. In case of complete disability, medical attendance and medicines may be supplied to families of members.

In the event of death of a contributor from the result of accident while in discharge of duty, either at the time or within six months thereafter, his heirs or representatives are entitled to receive $150 from the funds of the association. In the event of death from ordinary disease, an allowance is made of $50. These payments are conditioned upon a release of the company from all liability for damages growing out of injury or sickness. The liability of the association does not extend beyond the fund contributed by members, nor does the period of treatment and payment of daily allowances exceed the time the beneficiary has been a contributor to the fund.

At the time this association organized (October, 1882), employés up to fifty years of age were admitted, but of those subsequently employed none have been admitted over forty-five years old, nor any found in unsound health by the examining surgeon.

Any employé requiring medical or surgical relief must present a surgeon's order signed by a railway official, except in case of accident or emergency, when the order will be furnished as soon as convenient. Discharge certificates are given to patients on completion of illness or disability. The above benefits are not granted to those suffering from the results of intemperance, disorderly conduct, venereal infection, or any chronic disease contracted prior to entering the service of the company, nor to those who have paid no assessments.

The company has erected hospitals at Brainerd, Minn., and at Missoula, Montana Territory, for the benefit of contributing members, the former having accommodations for 90 patients and the latter for 70. No other hospitals are available for use in the sparsely settled region traversed by its lines. There is no examination of any class of employés with reference to integrity of sight and hearing, or soundness of general health. When doubt relative to the general health of an individual exists, he is subjected to a medical examination. It is evident that the object is rather to protect the funds of the association than to guard against accidents liable to grow out of defective sight or hearing of trainmen, or sudden failure of their vital organs.

The sanitation of railway-carriages, of buildings, grounds, etc., is attended to "in a general way." Strict regulations are enforced relative to transportation of livestock, to prevent over-crowding, deprivation of food and water, too long confinement, or admission of diseased animals to cars.

It was announced in 1883: "Vice-President Oakes of the Northern Pacific Railroad Company, has authorized the general manager to guarantee all benefits payable by the association to its members to the extent of $6,000 per annum. This is practically a contribution to the funds by the Northern Pacific Company of $100,000, if interest be considered at 6 per cent.; but at the rates of government bonds it would be equivalent to not less than $150,000 invested in such securities for the benefit of the association.

"The company also agrees to put in complete order and turn over to the association, free of charge, the large building now used as a hospital at Brainerd.

"Also to erect such additional buildings as may be required from time to time without cost to the association.

"The local treasurer of the Northern Pacific Railroad

company is authorized to act as custodian of the funds without charge.

"The Northern Pacific Railroad Company also agrees to furnish all blanks, forms and stationery which will be no small item.

"A part of the consideration to be paid to local physicians will consist of free transportation over the railroad, and this also will be furnished by the company, and relieves the association of expenses to that extent.

"With these liberal concessions on the part of the company, it is reasonable to infer that the amount of benefits to be paid to members in case of sickness or accident, in proportion to their contributions to the funds, will be largely in excess of the benefits payable in voluntary unions or associations, where on guarantees are given, and where, if the funds become exhausted, there can be no further payments without additional assessments upon members."

The following features are also indicated in the regulations, but I conclude have not yet gone into operation :

"Provision may also be made for annuities, after a given number of years of service, proportioned to the amount of dues paid in.

"A life insurance department may be included, if the board of managers at any time should deem such action expedient. The premiums for life insurance would be in addition to the ordinary dues and would be optional."

For information on the medical service of the Northern Pacific Railway, I am indebted to Mr. H. W. Knauff, the secretary, who has courteously answered the list of inquiries and furnished printed documents. He adds that "Our organization is working smoothly and satisfactorily, and has the sympathy and approval of the employés." There can be no question that the medical department of this company is now regarded as indispensable by both management and employés.

I am informed by Dr. W. A. Drake, chief-surgeon and hospital superintendent, that the Atlantic and Pacific Railway owns a building used as a hospital at Albuquerque, N. M., which is in charge of a resident physician, steward and nurse, paid by a fund that is made up of half-dollar deductions from monthly pay of all employés. Expenses of hospital, medicines, etc., are paid from the same fund. Physicians at points on the line of road are paid fees for attention to employés who find it impracticable to go to the hospital. The general management is by officers of the railway company without compensation. These benefits are enjoyed in ordinary sickness as well as injury from accidents, but do not extend to the families of employés. Exception is made to venereal affections and others growing out of misconduct.

No physical examination of men is made previous to their engagement by the company. No provision is made for relief of the families of employés sick, injured, or deceased in service, either by the company or by any independent organization among the men. Buildings and grounds receive some sanitary supervision, but there are no regulations relative to the transportation of live-stock.

The medical service of this company went into operation in 1882. It is evident that there is time and room for growth of the medical department of both of these companies.

THE CRACKING OF PAINT AND VARNISH ON CARS.

BY A. P. SWEET.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

THE subject, as I understand it, relates to the trouble of cracking, etc., as experienced in connection with passenger-car work, and as such I introduce it for discussion before this association.

There are many theories as to the cause of the cracking of paints and varnishes. Some are well defined. Others are not satisfactorily explained. I do not anticipate being able to add much to what is already known, but will advance a few thoughts which may call forth the views of others on the subject.

The old adage, "it takes two to make a quarrel," is as true when applied to paint and varnishes as it is to individuals. A single coat of either seldom, if ever, produces cracks. These make their appearance only after two or more coats have been applied; consequently it is necessary to have a body of color or varnish, consisting of two or more coats, before any trouble of this sort makes itself manifest. This being the case, it follows that the cause of the difficulty must be sought for in the coatings themselves, either in the quality of the material employed or in the mode of applying them. Poor and cheap oils and japans, especially the latter, are a fruitful source of cracking in paint, but by far the most prolific one, in my opinion, is the hurried application of succeeding coats before the preceding ones are dry enough to receive them.

If sufficient time is not given, cracks will inevitably follow such a mode of procedure. I am of the opinion, also, that very little blame can be attached to the wood used in the construction of the car, as the most of it is comparatively well seasoned, and its expansive and contractive force is not sufficient to cause serious trouble. If green wood were used there might be room for this excuse, especially where the cracks run in the direction of the grain, and are large and deep.

Before pursuing this subject further it may be well to examine a little into this theory of the drying of paint. It is purely a chemical process, not a mechanical one as as some suppose. Paint dries by the evaporation of its volatile parts and its absorption of oxygen, and it is heavier when dried than when in the liquid form; having attached to itself a sufficient amount of oxygen to increase very perceptibly its weight some six per cent.

The best grades of linseed oil are said to contain from 70 to 80 per cent. of substance called linaleine, a resinous and slow-drying oil acid, which imparts to the oil its elasticity.

In the process of drying contraction occurs; the various atoms of which the coatings are composed move closer and closer together, and as this contracting force is easier with than across the grain, cracks at right angles to it are formed. This fact suggests the necessity of so adjusting the elasticity of the various coats, that the force exerted in drying may be as nearly equalized as possible, as this contracting force is continued until all elasticity has left the paint, oxygen ceases to be absorbed, all the oil acid has disappeared and nothing but a hard, brittle surface remains.

Under the microscope, in the first stage of cracking, the surface presents nothing unusual except that the cracks appear clean-cut and sharp on the edges. As months pass by and the surface is exposed to the atmosphere, changes of heat and cold, wet and dry, the cracks become more numerous; and in the last stage, when the oil is entirely destroyed, the surface assumes the appearance of innumerable rectangular masses, higher in the center than at the edges, like small mounds raised by the power of contraction and adhesion.

Cracking in color coats may by careful attention to preliminaries be reduced to a minimum, provided good, first-class materials are used and sufficient time given each color to dry.

Where varnish is to be applied as a finish, all coatings should have oil in their composition, and yet be mixed to dry flat. They should be applied very evenly and thinly, even if it necessitates an extra coat to cover and make a solid job.

Striping and ornamenting should be done on flat color, which gives time for hardening and fits it for the varnish coats to follow. If work is done in this way, I think very little fear of premature cracking need be entertained: at least not until time and weather have sufficient opportunity to play havoc with its beauty, and the natural decay of the materials themselves necessitates a thorough overhauling and repair. Rubbing varnishes are another source of trouble, causing the succeeding coats of finishing varnish to show signs of cracking long before they otherwise would, as it does not agree with the slower-drying varnishes usually applied above it, being of a harder and more brittle character; serving the purpose of producing a fine smooth surface, but sacrificing the durability of the job.

Concerning the cracking of varnish I have not much to say. It seems to me that many of the reasons given above will apply to it as well as the paint. Poor material in the shape of varnish is poor indeed. A first-class article only will give first-class results. It must be elastic, or it will crack early and badly, no matter how good the under coats of paint may be. Good varnish on good color coats will not give any signs of cracking until by repeated varnishing it has accumulated a thick coating of brittle, inelastic gum. No painter can say truthfully that his cars never crack, as it is a natural consequence of decay and will come sooner or later to the best of material. That varnish cracks to a great extent at right angles to the grain of the wood, I think, is due in some degree to the same reasons as given above for the cracking of paint; and after its elasticity is destroyed by age, vibration has a great effect upon the hard and brittle coating of gum that remains, coupled with expansion and contraction caused by variation of temperature and the disintegrating influence of the weather.

THE RAILWAYS OF JAPAN.

THE British Legation at Tokio, through its Secretary, the Hon. P. Le Poer Trench, under date of April 31st, has promulgated some valuable railway statistics on Japanese railways. He says the Mikado's government is much occupied in construction, which in 1868–69 assumed a definite purpose. They met, however, with such strenuous opposition from the large party which always endeavored to impede any progress towards western civilization, as well as with other difficulties analagous to those which retarded the introduction of railways into England, that it was only in the year 1870 that this great step towards the opening up and development of the country was eventually determined upon. It was proposed to construct a railway connecting Yeddo and Kioto, the new and old capitals of the empire, together with a branch line from Yedo to Yokohama, and another from Kioto to Tsuruga, along Lake Biwa, which is the center of a great traffic, and which branch line would connect the west coast with the two capitals. By means of this latter line the rich crops of the great rice-producing districts were to be placed within easy reach of the metropolitan population, and the Provinces of Yechizen, Wakasa, and Omi were to be brought into close contact with Kioto and Osaka. Theoretically, the scheme was a grand one, but a great obstacle presented itself against putting it into practice, and that was the difficulty of obtaining the necessary capital for carrying it out. It was clear that the construction of so many railways could not be undertaken by the government without external assistance. It was therefore decided to make an attempt to get the funds abroad, and Mr. H. N. Lay, as commissioner for the government, was sent to London to endeavor to obtain a loan of £1,000,000. That gentleman succeeded in placing the loan on the London market at 98, bearing interest at 9 per cent. The scheme for making a railway through the center of Japan had, however to be abandoned, or, at any rate, postponed, and it was decided only to construct a line between Tokio and Yokohama. The Tokio and Yokohama section of of the Imperial Railways of Japan was the first railway constructed in Japan, and connects Tokio with Yokohama. It was commenced in 1870, under the supervision of Mr. Morrell, who died in 1872 and was succeeded by Mr. R. Vicars Boyle. The railway is eighteen miles long, and as a single road was opened for traffic on June 12th, 1872 (the state opening taking place at Tokio on October 12th of the same year), and was completed as a double line throughout on May 8th, 1880. The gauge is 3 ft. 6 in., the same as all the other railways in Japan. There are six stations—viz., Yokohama (terminus), Kanagawa, Tsurumi, Kawasaki, Omori, Shinagawa, and Shinbashi (Tokio terminus). From Yokohama the line passes for one and one-half miles along an embankment constructed across Kanagawa Bay, thence to Shinaga, mostly through wet rice-fields, then by an embankment of two miles over the mud flats of Shinagawa, and the last one and one-quarter miles through a portion of Tokio to Shinbashi Station, the terminus. The engineering difficulties were few, the country passed through being very flat, and the heaviest gradient being only one in a hundred for one mile. The largest bridge, over the Rokugo River, near Kawasaki, is constructed of iron, and has six spans of a hundred feet each, and twenty-four spans of forty-four feet for flood openings. The total cost of the line is said to have been £616,734, or about £34,263 per mile. Considering that the engineering difficulties were few, and the country traversed flat, the amount expended on the construction of this railway appears to have been needlessly large, especially when compared to the cost of the Kobe, Osaka, Kioto, and Otsu lines; but it must be borne in mind that it was the first railway constructed in Japan, and that consequently in the matter of ruinous contracts the government had to pay dearly for its experience.

In 1873, the number of passengers carried on this line was 1,223,071, while in 1884 the figures had increased to 2,172,105, while the coaching receipts, which in 1873 were 395,988 yen (5 yen to the pound), had increased in 1884 to 491,383 yen.

The goods carried and the receipts therefrom rose from 9,121,431 kin (8 kin = 1 cwt.) and 24,590 yen in 1874, to 56,912,207 kin and 42,253 yen in 1884, respectively. The line in 1881, the last year for which the expenses are given, was worked at about 50 per cent. of the revenue. Mr. Trench states that railway traveling is as popular with the lower classes in this country as it is with the native population in India. The goods-traffic, however, has never been properly developed, but it will doubtless greatly improve now that the branch line from Shinagawa to Kawaguchi has been completed. Another and a still greater impetus would be given to the goods-traffic if the government were to carry out the project of constructing a pier at Yokohama (connected with the railway by a goods line), where merchant vessels could load and discharge their cargo. When the line was first opened, all the rolling-stock was got from England, but after a time workshops were established at Shinbashi, where now all the carriages, wagons, etc., are made. but the wheels, axles, and buffers are still imported, and all the engines come from England. The line is very well managed, and should bring in a handsome revenue to the government, but to ascertain the exact amount is impossible; it is only known to the Japanese officials. The fares are moderate, but more liberality might be shown in the issuing of return tickets, and season tickets would also be a great boon to the large number of people who make constant use of the line. This is the only double line of railway in Japan. The second railway built in Japan was the Kobe and Osaka section of the Imperial Government lines. It was opened in 1874 for its full distance of twenty-two miles, the cost of construction being £747,371, or about £33,970 per mile. From Osaka to Kioto, a distance of twenty-seven miles, an extension was opened in 1876, at a total cost of £563,589, or about £20,875 per mile, and the further extension from Kioto to Otsu, 11¼ miles, at a cost of £157,227. The Tsuruga and Ogaki Railway (49 miles), which connects the northern end of Lake Biwa with the Japan Sea, was commenced on April 6th, 1880. Cost of construction, 2,895,462 yen, or about £550,000, which is 522,669 yen less than the original estimate. The first section was opened in 1882, and the last in 1884. The Temlya-Sapporo and Poronal Railway, which is under the control of the Department of Agriculture and Commerce, is 56½ miles in length, was opened for passenger and goods-traffic in November, 1880, as far as Sapporo, in June, 1882, to Yebetsn, and the whole line was completed in May, 1883. Cost of construction, 1,228,452 yen, or about £204,742. This railway is the only one in the Island of Yezo.

The Japan Railway Company has an authorized capital of 20,000,000 yen, divided into 400,000 shares of 50 yen each. The amount of shares issued on the formation of the company was 119,314, and at a general meeting of the shareholders, held on January 29th last, it was determined to make a further issue of 119,314 shares, so as to increase the paid-up capital to 11,931,400 yen, and thus enable the company to proceed with the construction of the several lines they have in contemplation. The Uyeno (Tokio), Takasaki, and Mayebashi section of the Japan Railway Company's line (68¼ miles), was commenced in 1882, and was opened on October 21st, 1883, as far as Honjo (51¼ miles from Tokio), to Shinmachi on the 27th, of that year, to Takasaki on May 1st, 1884, and to Mayebashi on August 20th last. The formal opening of the line to Takasaki by His Majesty the Emperor took place on June 25th of last year. Cost of construction about £300,000, but besides this sum a considerable outlay is still necessary for the construction of permanent bridges of iron, with brick and stone foundation, over several rivers of considerable width, hitherto crossed by mere temporary structures of timber.

Ordinary accidents and casualties occur from time to time, as on all lines of railway, but, with the exception of the one in October, 1877, there have been none of a very serious nature, and willful damage to railway property is happily almost unknown in the country. The average rate of speed, including frequent stoppages, is 18 miles per hour, but in hilly districts, where the gradients are heavy, it is a good deal less. There are several new lines in the course of construction.

CAN RAILWAY COMPANIES AFFORD TO BUILD THEIR LOCOMOTIVES?

We have already given some very excellent and well-supported arguments by several manufacturers in support of the proposition that it is cheaper for railway companies to purchase their equipment by special contract than to manufacture it in their own shops. A well-known locomotive builder, in an interesting letter in our issue of October 8th, went over the general ground and dwelt somewhat on the proposition that if railway companies kept up their equipment to a standard and did not wait until they were obliged to make large orders they would not be in danger of having to pay excessive prices on account of sudden demand. We will now recapitulate some of the arguments in favor of buying locomotives by contract which have been brought out or suggested by the discussion thus far.

Railway master mechanics of course are disposed to think that they can build as cheaply as they can buy, if not more cheaply. How do they know? Assertions are easily made, but can they be supported by the detailed figures?

It is not an easy matter for a railway company to take account of all the elements of cost which are concerned in the construction of locomotives in its own shops. The cost of materials actually purchased for the purpose and the amount of wages actually paid to the men working on such locomotives may be readily ascertained; but there are various other items of cost which it is difficult if not impossible for the company to know. Among these we may mention the following:

1. Interest on capital.—If a locomotive is to be built, the material for it must be purchased several months before its completion. Wages must be paid also for several months. Interest should be calculated on the amount of capital necessary to do this. A railway company, equally with a private manufacturer, must pay something for the money employed. If the company does not pay for the money so employed, it means that the stockholders lose that much return on their capital invested. The capital invested in tools, buildings, etc., is also to be considered.

2. It is common to charge to the construction of a locomotive the materials *at the actual cost*. This cannot be correct; because the handling and storage of materials usually costs something, and there is a certainty of unsuitable materials accumulating, which eventually have to be thrown away, or sold as scrap. These considerations, confirmed by the experience of every manufacturer, indicate that it is impossible to buy materials and charge them out at the cost price without making a loss.

3. Freight on materials.—The cost of hauling materials from the points on the company's line where purchases are made to the shop where the locomotives are built is usually overlooked. In some cases in our knowledge the entire amount of coal hauled over the company's line to keep the shop running had no freight charged to it.

4. Spoiled work, defective material, etc.—In the practice of every shop it will be found that after considerable work has been done on some parts of a locomotive, defects may be developed which will necessitate throwing such parts in the scrap pile and making them over. Mistakes also occur; parts are incorrectly fitted up. These elements of expense should be borne by the locomotive under construction. It is frequently the case, we think, that they are entirely ignored, and that the locomotive is only charged with the cost of the finished and perfect parts which finally compose it.

5. General expense.—The most important point is the inadequate allowance for general expenses. If the wages of the machinists, blacksmiths, iron-founders, and other mechanics employed in the construction of a locomotive, amount to say $4,000, the amount of incidental expenses for superintending, foremen, draughtsmen, clerks, purchasing agency, shop clerks, janitors, carters, helpers, etc., is a very high percentage of the wages paid to the mechanics. This percentage is very much larger than is commonly supposed. It may be stated approximately, including repairs of buildings, maintenance of tools, taxes, insurance, etc., at from 60 to 100 per cent. of the amount paid for direct labor; in other words, if $4,000 is paid to the mechanics who work directly on the locomotive, from $2,400 to $4,000 additional would be absorbed by all the incidental labor and expenses involved. The accounts of any manufacturing establishment will indicate this.

Now, the great locomotive-building establishments *know* exactly how much every engine which they build costs them. There is no guess-work about it; no convenient ignoring of many elements of cost which railway officers and employés often think it is not worth while or not expedient to charge up. We have printed the items contained in a form used by a leading firm of locomotive builders, showing in exact detail the number, description, weight (if material), rate and amount of every article and element going to make up the cost of each individual locomotive built. The list comprises 429 different elements of cost, under 16 subdivisions. The use of this form will effectually test the accuracy of railway shop accounts. If the railway master mechanic will fill up the form fully and accurately it is probable that in most cases it will indicate that many items are ordinarily overlooked, and that the actual cost of a locomotive is generally a good deal more than the apparent cost as reported to the company.

Can railway master mechanics gainsay the arguments and assertions which have thus far been produced on the side of the contract shops? If so, let us hear from some of them. The question involved is of very great importance to railway companies, and we desire the fullest light upon it from both sides. Much more might be said in regard to locomotives, and the car-builders have not yet been heard from specifically.—*Railway Age*.

Car-Seats.

THAT an entirely new departure in car-seat construction is needed is apparent to any one who has studied the American car, says the *Scientific American*. One difficulty to be met and overcome is the insufficient width of the American car-body. Bodies from 12 to 18 inches wider than those now in use may safely be carried on trucks of the standard-gauge, even at high rates of speed. This has been done for years on the Erie road, without accident. A wider car would, however, call for radical alterations in stations, platforms, bridges, tunnels, signal-towers, and even in the tracks of some roads.

Such alterations and improvements cannot be looked for at present. More room in the seats can be obtained by sacrificing one seat in the width of the car; the space thus gained being given to the aisle and the three remaining seats. Many faults of car-seats may be corrected without structural changes in the cars themselves. One glaring fault is the insufficient width of the seat, from front to back, which does not properly support a full-grown person. The cushion is of improper shape, being highest in the middle; a form made necessary by the reversible back, although its convex form is much better than those in which an attempt has been made to fit the person. The back is too low to support the head and shoulders comfortably, yet it projects from seven to eight inches below the level of the seat, and is so much too wide. This wastes a large quantity of expensive covering material. Most backs do not give support at the proper place, and are convex on the corners, where concavity is needed. They should be convex both horizontally and vertically. The seat, from 17 to 18 inches high at the front edge, is about right for a six-foot man, yet the foot-rest is too far away to be of use even to a tall person, and is beyond the reach of others. With a practicable rest the present height would be proper. The seat-frame, while bulky and heavy, is not strong, and is placed so low that there is no room beneath the seat. By simple modifications of the frame, this space could be utilized and available for satchels, etc.

Another evil belonging to the reversible back is the necessity for making the seat parallel with the floor. A tilting seat, which tips the frame one-half or three-quarters of an inch, has in a few cases been adopted, It costs much and the advantage is not appreciable. The inner end of the seat is well covered with catches, mouldings and bars which search out tender portions of the anatomy. The sharp moulding is architecturally correct on the window rail, because as a cornice it crowns a wall. This may satisfy the architects, but common passengers would rather violate architectural proprieties and have round corners well cushioned.

Alterations are needed in the aisle end of the seats. The fashionable wood end is less comfortable than the old style of iron, and is inconvenient because it is open. The arm rests are hard, and the "nickel-plated horse-

rasps" of some roads are a public nuisance. A plush surface is by far the most satisfactory.

The following average dimensions of passenger-cars and seats will give the inventor some idea of the problem before him: The inside width varies from 9 feet 2 inches to 8 feet 5 inches above the truss-plank; below or within 11 or 12 inches of the floor the car is usually from 2½ to 4 inches narrower. Seats are spaced from 26 to 36 inches between centers, and have from 11 to 18 inches in the clear at the level of the seat. The latter is a liberal figure. The back is from 26 to 37 inches long, which leaves an aisle of about 24 inches, according to the width of the body of the car. The seat-cushion is longer than the back to the extent of an inch or two. The cushion is from 17 to 20 inches wide, and stands from 17 to 19½ inches high. The backs come from 16 to 18 inches above the cushions, and are from 25 to 30 inches wide from top to bottom. The waste of covering material on some of the wider backs, on account of their projection below the cushions, amounts to as much as half a square yard. This may be averaged at from 12 to 14 yards per car. Seat-arms are from 25 to 27½ or 28 inches from the floor.

The following are some of the points of a comfortable seat: It must be convex wherever it touches the person, as hollow curves are tiresome. The back should be convex, both horizontally and vertically, except where straight lines are used. The seat should be inclined, and there should be a good foot-rest.

Parlor-car chairs are even more objectionable. Nominally revolving, they interfere with each other, and are less comfortable than if fixed. They have most of the faults of the day-coach seats. The promising field for the inventor is in the seat of the day coach, and certainly he who devises and introduces a seat meeting the requirements of the case ought to be well rewarded financially.

Car-Coupling Tests in Michigan.

MR. WM. MCPHERSON, JR., commissioners of railroads of Michigan, has sent out the following circular in relation to his contemplated tests of automatic and safety freight-car couplers:

"The large number of letters received at this office making inquiry in regard to the test of automatic and safety freight-car couplers to be selected for use in this state, as provided by the enactment of 1885, seem to make necessary a supplemental circular to that issued by me under date of July 10th, 1885.

"Since the issue of that circular, the Master Car-Builders' Association, through its executive committee, has held a test at Buffalo, N. Y., at which more than forty prominent coupling devices were offered for trial of their merits. Of these, after a fair and thorough test, the committee selected twelve to be placed upon the cars of different roads, for a thorough working test through the next winter. Their performance will be closely observed, and results reported at the next meeting of the association, and from the twelve in all probability will be selected the devices to be adopted for use upon the cars of the companies represented by the committee. The officers of this department were present at the above mentioned test, and witnessed the performance of each coupler tested. By the courtesy of the committee they were also enabled to carefully note all details of interest and value, bearing upon the cost and construction of each device presented. It seems unnecessary to again go over the ground covered by the trial at Buffalo, and as a further general test would involve heavy expense to both parties presenting devices for trial, and the state, I have concluded to dispense with that contemplated by the circular of July 10th ult.

"There seems no room for doubt, that the recommendation of the executive committee of the Master Car-Builders' Association will determine the couplers with which the companies of the New England states, New York, Pennsylvania and Ohio, and the great trunk lines of the west, will equip their cars. With the roads of those sections especially, our own have the largest and constant interchange of traffic, and the best interests of companies and trainmen in their employ, alike demand that the couplers to be selected for use under the provisions of our law should be as nearly uniform with those adopted by the companies of the above-mentioned states as possible.

"But that parties interested and not present at the Buffalo test may not be excluded from fair recognition by this department, if upon presentation of their devices at this office I am of the opinion that their merits will warrant the incurring of the expense of a practical working test, I will so advise, and suggest a plan for carrying the same into effect, and will give such devices due consideration in making any selections of couplers under the law."

American Inventions upon the Locomotive.

THE temporized character of the early American railways and the severe conditions still enforced upon rolling-stock by the irregular alignment, heavy grades and elastic road-bed still in use on American railways, have, according to *Engineering*, presented difficult problems to the American engineers, and in the course of their solution many inventions have been produced which are essential here, and some of them generally applied on all locomotives. The non-condensing and high-speed engine of which the locomotive is merely one type, was invented by Oliver Evans in 1785, and the multitubular boiler was originated in 1788 by Nathan Reed, a judge in one of the Massachusetts courts, and patented by him August 26th, 1791. The pony trucks at the front of a locomotive were applied as a matter of necessity to the early locomotives on the Baltimore and Ohio Railroad by Gen. Isaac Trunbull. Ross Winans was anticipated in the invention of the swivel truck used on all American cars by a man employed on a granite (syenite) quarry in Quincy, Massachusetts, where a railway was used for transporting the stone to the tide water. Winans patented his invention, and his suit against the railway companies was defeated by the testimony of this quarryman, who never received anything beyond the legal fees as a witness for his valuable evidence. The inventions of Winans are numerous and important, among them being the bar frame, cylinders with projections allowing them to be bolted together at the centre, cast-iron wheels with chilled tread, and many mechanical details in every part of the engine. Thomas Rogers, of Paterson, N. J., first made the open cast-iron driving-wheels and applied counterweights to balance the connecting-rods, and also the expansion braces, to pre-

vent the expansion of the boiler from distorting the machinery. The air-chamber used on the pump was invented by W. MacQueen, of the works of the New York Central Railroad at Schenectady. Another important pump detail is the ground joints in pipe connections first made by M. W. Baldwin, who founded the locomotive works at Philadelphia known by his name. Another Philadelphia invention is the equalizing bars invented by Joseph Harrison in 1837. The American locomotive cab was first made by David Matthew, although far from its present complete form. No single invention has contributed so much to the close running of trains at high speeds, yet compatible with safety, as the automatic air-brake of George Westinghouse, Jr., of Pittsburgh. The application of a lamp with a parabolic reflector to throw the rays of light along the track is an American invention. In its general line and proportions, which go to make up the peculiarly "American" type of locomotive no one did more than Colonel William Mason, of Taunton, Mass., who exhibited in the design of many classes of machinery a degree of taste rarely found in mechanism, also conforming to the severe requirements of strengh and practical operation.

Changes in Note of Bell or Whistle.

THE change in note of the bell or whistle sounded on a rapidly passing train is very noticeable, and is thus explained in the *American Machinist:* Supposing two trains were running in opposite directions at 60 miles per hour each, and that the bell strikes when they are 1,156 feet distant. These trains would pass in about six seconds. It would require one second for the sound of the bell to reach the other train, so all the sound made in six seconds must be heard in five. A bell that gives alto *C*, vibrates 528 times per minute. Here are 3,168 vibrations heard in five seconds, which is at the rate of 633 per second, or not quite up to *D*, which require 660 vibrations. As the trains approach, the vibrations get nearer, and at the moment when the trains pass the vibrations are heard as they are made at the rate of 528 per second.

The rule holds good as the trains recede from one another. When they have traveled 1,156 feet, or six seconds, a person on either train requires seven seconds to get the whole number of vibrations given by the bell or whistle on the other train. This is equal to 452, or almost down to *B*, which requires 462 vibrations per second.

The Storm King Bridge.

A MORTGAGE for $6,000,000 has been filed in the clerk's office of Orange county, N. Y., signed by Chauncey Vibbard, president of the New England and Southern Railroad Company, to the Central Trust Company of New York as trustee. The mortgage covers the entire line of road, including the bridge over the Hudson river at Storm King, from a connection with the New York, Lake Erie and Western Gray Court Branch to a connection with the Harlem and New York and New England roads at Brewsters, N. Y., twenty-six miles of road.

The Phœnix Bridge Company has contracted to build the bridge and road. It is understood that four prominent railway men will take seats in the board of directors within the next ten days, and that the bonds will be taken by a syndicate now in course of formation. The bridge will be 235 feet above high-water mark, and will be the greatest cantilever bridge in this country. The Phœnix Bridge Company will begin operations as soon as possible, and will push the work to an early completion.

The Era of New Fuels.

THE revolution produced by the discovery and introduction of natural gas is only equaled by the rush for appliances for the production of other forms of cheap fuel. Within the past fortnight, organizations have been effected at New York City for the purchase of all descriptions of refuse oil residuums; at Troy, N. Y., for the manufacture of fuel-gas; at Cleveland, for the utilization of oil residuum; at Pittsburgh, for the manufacture of water gas on the Dawson (English) principle, and at Chicago, for the burning, in stoves and under boilers, of crude petroleum. In this connection, we learn, says the *Iron Trade Review*, that the Chicago enterprise is but a part of an extensive movement, emanating from the Pacific coast, for the introduction of oil-burning appliances under what are known as the Jones patents.

English inventors appear to be traversing much of the same ground already gone over on this side of the ocean. The London *Iron Trade Exchange*, for instance, devotes an article to a description of the method devised by Colonel Sadler, managing director of Sadler & Co., chemical manufacturers, of Middlesborough, by which the residuary oils from coal tar products are utilized for the heating of boilers. Although this device has cost Col. Sadler several months' experimenting, it is not apparent that he has gotten much beyond the ordinary steam-jet atomizer familiar to American experimenters in the same line. But the fact is significant as showing the attention paid to this important subject in a country remote from oil-producing districts, and it is especially significant because of the claim that the new fuel can be furnished at a lower cost than English coal.

Competitive Tests of Automatic Freight-Car Brakes.

THE committee on automatic freight-car brakes of the Master Car-Builders' Association have issued the following notice:

The Master Car-Builders' Association Committee on Automatic Freight-Car Brakes invite the manufacturers of such brakes to a competitive test to be held at Burlington, Iowa, on December 14th, 1885, and on May 14th, 1886. The condition of the tests will be as follows:

1. Each brake company to furnish, fitted with its device, fifty 28 or 30 feet box-cars of 40,000 pounds capacity, delivering the same to the committee free of charges at some point on the Chicago, Burlington and Quincy Railroad, on or before December 7th, 1885, and leave them in the hands of the committee till after the trial of May, 1886.

2. The owners of the brakes will be reponsible to the car owners for mileage made from December, 1885, to May, 1886. Between the trials the equipment will be kept on the lines of the Chicago, Burlington and Quincy Railroad, and that company will be responsible for any damage occuring to it while on its lines that come under the rules of the Master Car-Builders' Association.

3. The December tests will be made while the brake attachments are new and in good condition. No brakes will be allowed on the engine, and hand-brakes only on the tank. Mechanical appliances for operating the car-brakes from the engine or tank will be allowed. The brakes must be fitted to both trucks and with plain cast-iron shoes. Other details of the trial will be such as may be presented and agreed upon by the committee prior to the trial.

4. After the December trial the brakes will be put into general service, receiving only ordinary repairs—a careful record of the cost of which will be kept. In May, 1886, the cars will be called in, and, without being prepared for trial, the December tests will be repeated.

G. W. RHODES, Chairman.
GEORGE HACKNEY,
BENJAMIN WELSH,
JOHN S. LENTZ,
W. T. HILDRUP,
Committee.

NOTE.—The Committee will not provide equipment for these tests. Three or more competitors will be required before the tests will be entered into. Any brake company desiring to compete should at once communicate with the chairman of the committee, whose address is Aurora, Ill.

Prizes For Railway Improvements.

THE German Railway Union has recently awarded prizes in accordance with an offer which it made in 1883 for inventions and improvements, methods of office work, statistics, and books on railway topics, brought out during the six years, ending July 15th, 1884. Richard Schwarzkopf, of Berlin, received $729. as a prize for a safety apparatus for steam-boilers; Herr Heinde, of Vienna. the same amount, for his system of iron cross-ties; Herr Schrabetz, of Vienna, $364. for his rail-bending machine; Herr Mahla, of Bavaria, $729. for hose-coupling for steam-heating apparatus for cars; Herr Sedlaczek, of Austria, $364. for an electric head-light; Herr Ulbrecht, of Saxony, $364. for a manual calculating traffic statistics; Brosins & Kock for their work entitled "School of the Locomotive;" Prof. Frank, of Hanover, for his "Treatise on the Resistance of Locomotive and Trains, Water and Coal Consumption, and the Work of Locomotives."

Railways in Alabama.

THE length of completed railway track now in operation in Alabama, including main line and side-track, is 2,182 miles, of which 960 miles are laid with steel rails. One hundred and sixty-four engines are in use on the Alabama roads, together with 87 passenger-cars, 27 baggage, mail and express-cars, and 2,695 freight-cars. The total capital investment is $73,013,319, the actual cost of the roads and equipments being $63,693,690. The number of miles traveled by passenger-trains during the past year was 1,520,512. During the same time freight-trains ran 2,725,753. The 1,269,504 passengers carried traveled 56,976,957 miles, and their tickets cost them $1,510,073. The freight moved amounted to 2,654,454 tons, for which the roads charged $4,613,620. The roads paid interest on bonds to the amount of $1,818,604, and declared dividends amounting, all told, to only $130,000. It will be seen that the number of passengers carried about equals the population of the state.

A Strategic Railway.

RUSSIA is building a strategic railway to the Austrian frontier. A strategic railway is not difficult to make, according to the London *Railway and Tramway Express.* The promoter buys a right-of-way from the farmers for an annual pass, then gets all their land condemned and takes up the passes, then gets a state grant of two or three districts for the directors, buys its iron on long time, and pays for its grading with construction bonds, then issues equipment bonds to pay for rolling-stock, borrows all the money in the country on the mortgages, calls in everything outstanding and exchanges it for a deficit—then changes its name.

MR. THEODORE VORHEES having resigned the position of superintendent of the Saratoga and Champlain Divisions of the Delaware and Hudson Canal Company, and the several divisions composing the Northern Railroad Department, viz.: Suesquehanna, Utica, Saratoga and Champlain, having been consolidated, Mr. C. D. Hammond has been appointed superintendent. The office of secretary of the Northern Railroad Department is abolished, and Mr. J. White Sprong is appointed comptroller and purchasing agent.

INTERESTING particulars continue to arrive from Russia of the progress of the railway that is being hurried on to the new position Russia has acquired on the Afghan frontier. The electric light having broken down owing to an accident to the apparatus sent, the men are working at night by the aid of hundreds of lanterns and huge fires fed with petroleum refuse. As far as Askabad the road has been levelled, and it is expected that the final rail will shortly be laid.

THE Pennsylvania Railroad Company is about to engage in the reduction of grade-crossings on its New York division. This is to apply to every point on the line, and it is believed that this will enable the company to reduce the time to Jersey City at least half-an-hour. The work will be very expensive, but the company will be compensated for it by the time saved, and the expense avoided in paying damages.

THE projected Maryland and Delaware ship canal is to be 17 miles long, 171 feet wide at the surface and 99 feet wide at the bottom. It will be 27 feet deep. To build this channel will require the dredging of 43,000,000 cubic yards of earth. Machines will be used that will lift from 10,000 to 15,000 cubic yards per day. The canal will cost $8,000,000.

MR. WILLIAM G. VAN BUSKIRK has resigned his position as master mechanic and master car-builder of the Newburgh, Dutchess and Connecticut Railroad, after serving acceptably in those capacities for seventeen and eight years respectively, and has been succeeded by Mr. Gilman D. Holmes.

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NEW YORK, NOVEMBER, 1885.

Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

EDITORIALS.

MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

NEW INVENTIONS.

RAILWAY RECEIVERSHIPS.

THE two receivers of the West Shore road have modestly preferred their claims for $700,000 compensation for eighteen months' service in their official capacity. The judge in whose court the receivership proceedings were instituted had fixed their compensation at $40,000 each, determining this sum as the highest paid as salary to any railway official in the country. But the two receivers were not satisfied with any such trifling sum as $40,000, and applied for the noble sum of $700,000 as being their just due under a ridiculous act of the New York legislature known as the HAGGERTY Act. By the provisions of this act receivers are allowed, as compensation, five per cent. of the first hundred thousand dollars actually received and paid out, and two-and-one-half per cent. upon all sums received and paid out in excess of the before-mentioned one hundred thousand dollars. The clumsy legislator who framed this act and the equally clumsy legislators who voted for its passage, were doubtless prompted by a desire to limit the compensation of receivers and cheapen the cost of settlements by the courts. But, as might be expected when august legislators are generally a set of inflated numskulls, the act in question defeated its very purpose and gave a legal color to the most extortionate demands of the army of receivers. The receivers of the West Shore have the law upon their side, and the award of the judge is to be contested in the Court of Appeals.

Now it strikes us that $25,000 per annum each, which was the allowance made by Judge BROWN, is ample compensation for the receivers' services. It is the highest salary paid by any solvent railway to any of its officials, and should certainly be considered sufficient to compensate the two gentlemen who have managed the finances of the West Shore for the past eighteen months. But the same strange perversion seems to have possessed these gentlemen that possesses every receiver of an insolvent corporation—that a receivership is the signal for reckless and wanton extravagance; to imagine that to a receiver money should be no object, and that what would be imprudent in the conduct of a solvent corporation, would be merely shrewd management in the conduct of a bankrupt concern.

At present there are a dozen leading lines of railways in this country under the management of receivers, and it is safe to say that of this dozen the majority are engaged, in the most reckless and prodigal manner, in leasing other roads, branching out into new fields, conducting their affairs on a scale of generosity and magnificence, and "booming" things generally, as if the treasuries behind them were limitless. Yet these railways have been forced into the courts through their crippled financial condition and have been put into the hands of receivers—for what?

To our way of thinking—it is an old-fashioned way, but we stick to it nevertheless—a corporation is put into the hands of a receiver for one of two purposes: Either that the affairs of the concern may be wound up with the utmost expedition and economy, or, in event of its resuscitation being possible, that its affairs may be conducted with such conservatism and watchfulness of expense, that it may be returned to its original management in a healthy condition and in as soon a period as possible. It is unnecessary to state how great is the perversion from this original idea of receiverships. The position of receiver is now sought as one seeks a lottery ticket—for its possible chances. The record of recent receiverships, and especially of railway receiverships, shows that economy and conservatism have been the last things thought of, and that the era of receivership is an era of wild speculation and of reckless extravagance. Surely it is about time that some other method were sought to conduct the affairs of an insolvent corporation.

THE PHILOSOPHY OF ACCIDENTS.

WE publish this month the third of Mr. WM. S. HUNTINGTON'S admirable series of articles on the subject of the prevention of railway accidents. The author knows what he is writing about and has devoted years of study to the problems he discusses; and doubtless were all his recommendations put in force there would be a sensible diminution in the frequency of railway disasters. But is it possible to reduce railroading to such a perfect system that accidents will never occur? We fear not. There are too many elements at war with each other—too many conditions beyond the scope of human control—for us ever to attain such a blissful state of affairs.

There is not, probably, any railway in the country more admirably conducted with a view to the avoidance of accidents than the Pennsylvania Railroad. The most approved signal systems are in use, the greatest care is exercised in the selection of its employés, the most rigid and practical rules are enforced, and it would seem that an accident on the lines of that road would be well-nigh an impossibility. Yet on the 18th of last month three trains were hurled upon each other and a number of lives were lost at a point on the road where extra provisions for safety had been adopted. And the cause of this dreadful disaster was traced to the incomprehensible absent-mindedness of a reliable signal-operator. It is well enough to punish this unfortunate man, and doubtless such punishment is a necessity as an incentive to care and watchfulness on the part of signal-operators and other railway employés in whose keeping are the lives of the traveling public. But the whole record of the operator in question shows conclusively that he was one of the most trustworthy in the employ of the company, and possessed as high a degree of reliability as could be expected to be attained by a human being—and that is the weak point. It is impossible for any man to prove infallible; for him to maintain, year in and year out, a machine-like precision coupled with reasoning action.

It needed but a few years of railroading to demonstrate that infallible trust could be reposed in no one single man. With all a man's intelligence, his uniform attention to duty, the time would occur when temporary abstraction, either caused by sudden physical ailment or by unexpected and unpremeditated diversion of thought from the business of the moment, would bring about a catastrope appalling in its results. The attention of railway officials was then directed to the invention and application of mechanical devices—unreasoning, unvarying machines that would in every case record the necessary signals—and care was even taken that should these devices, through failure of the connecting mechanism, be unable to perform their functions, the failure would indicate danger. Positive and correct action alone indicated safety. But the railways had only escaped from Scylla to be entrapped by Charybdis. The dull, unvarying machine could only act according to one unvarying rule. It could not reason and had no responsibility. Occasions would occur when a suspension of the rules was a sudden and imperative necessity—when unforseen emergencies arose that upset previous calculations—and to perform the service necessary the machine required what it had not—a power to think.

It became evident that there was little to choose between the intelligent, but rarely erring man, and the reasonless, but reliable machine; and the evolution of railway service finally brought to action the seeming perfect combination of the two. The mechanism was trusted to perform the unvarying, reliable portion of the service and the intelligent man the reasoning portion. Greater precaution could not and never can be devised, and the Pennsylvania road was among the first to adopt this dual system. And yet the disaster of last month occurred in the face of such precautions, and its recurrence is not impossible. The mathematical chances of the mechanical and the reasoning elements of the system both failing at the same moment are infinitesimal, and consequently need not be considered as existing; but the accident in question was caused by the deliberate error of the operator—an error not of omission but of commission, and against such catastrophes there is absolutely no safe-guard. At first thought it would seem that had two operators been required to be at the signal-station instead of one, and had both been required to observe the signals before the second train had been given permission to proceed, the chances of the accident would have been lessened. But, upon reflection, it is easy to see that the presence of two men, on the other hand, would have resulted in a perpet-

ual interchange of conversation that would have militated against the benefits of extra safety.

So long as there are railways there will be accidents. Human wisdom can take every precaution, can leave no stone unturned to discover the surest and safest means to provide for every emergency. But so long as mere mechanism is without reasoning power, and so long as human nature is liable to periods of weakness, so long will there be failures to meet the urgencies of railway service. And mechanism will always be reasonless, and human nature will always be liable to err. It is only in the lessening of chances that the railways can provide against disasters, and accidents will occur despite the utmost precautions to prevent them. Therefore, knowing that a class of accidents exist which may be classed as unpreventable, so much greater is the responsibility of the railways for the occurence of accidents that are preventable by the exercise of proper precaution and the employment of approved safety devices.

EDITORIAL NOTES.

For the first six months of the present year the total new railway construction in the country is announced to be but 895 miles. Previous experience would teach that upon this basis the total construction during the year would not exceed 2,500 miles, which would place the record below previous records for many years back. But despite this, the showing is a good one. It is an indication that railways are awakening to the fact that good things may be overdone—that they realize the wholesomeness of the maxim *festina lente*.

* * *

As we go to press we learn of the sale of the West Shore road to Messrs. Chauncey M. Depew, J. Pierpont Morgan and Judge Ashbel Green for $22,000,000. In opening the sale it was announced that no bid of less than $22,000,000 would be received, and that $750,000 of the purchase money must be paid on the day of sale and the balance on or before December 15th. There was no other bid. One chapter in the history of this singular road is now ended, but an interesting career is still before it. The purchasers disclaim that the road was bought in the interests of the New York Central, but there will be many persons who will receive this disclaimer with doubt and suspicion.

* * *

At last one vexed question is settled in the traffic agreement between the Baltimore and Ohio and the Staten Island Rapid Transit Company by which the former is to reach New York over an independent line from Bound Brook, N. J., crossing to Staten Island by a bridge, and then running on the Island company's tracks. At least this is the programme, but it is liable to sundry interruptions. If we are not greatly mistaken, the good people of New Jersey are rather "sot" in their views concerning a Staten Island bridge, and incline to the belief that such a structure would act to the detriment of state interests. Furthermore, they are inclined to believe, and their belief is geographically sustained, that by rights Staten Island should belong to Jersey. If New York will surrender the island to New Jersey the people of the latter state will raise no opposition to the construction of bridges to the main land, but they certainly do object to the island being prospered at Jersey's expense.

* * *

And now the Master Car-Builders' Association, having temporarily exhausted the subject of car-couplers, will undertake the solution of the equally vexed problem of automatic freight-car brakes. The official announcement of the association will be found upon another page, and unquestionably the test will be conducted honestly and without favor. But the difficulty will be to convince the railway world that the successful competitors possess the best appliances. True, the brakes meeting with endorsement may be better than those which are left behind in the competition, but may there not be equally good appliances, the inventors or owners of which may be unable to comply with the requirements of the test and may not have the necessary means to enter their devices for competition? This same view of the case appears to have struck the commissioner of railroads of Michigan, who, recognizing the value of the car-coupler tests at Buffalo, has concluded to dispense with his intended test, but announces that those inventors whose couplers were not tested at Buffalo may have an opportunity of demonstrating to him the merits of their devices with a view to their possible endorsement.

* * *

The "Short Hour League," an organization in England for the reduction in the hours of labor, have taken up the subject of railway service, and are endeavoring to have the working hours of railway employés lessened. In this country there is little need for agitation on this subject. Nearly all of the main lines recognize a plenitude of rest as absolutely essential to the care and watchfulness of its employés, and whatever may be the hardships of the latter they do not, except in unusual cases, have reason to complain of overwork. Still, there may be a few instances where the hours of railway employés are too long, and small mercy should be shown a road on which accidents occur through the physical and mental exhaustion of its operatives.

* * *

The town of Pullman, Ill., was conceived and built in the most approved light of human wisdom. Comfort, perfect sanitation, educational facilities, proper recrea-

tive pursuits—all were considered; and the proprietors of the town thought they had ministered to every proper want on the part of their employés and consequent inhabitants. But it seems that discontent is prevailing there, and the restive American mind pants for a share in the government. This is very natural and patriotic, but we are forcibly reminded by it of an anecdote of the renowned BOB INGERSOLL. An Irishman, so INGERSOLL relates, was shipwrecked upon a foreign coast and was rescued by an inhabitant of the country. Upon regaining speech the castaway turned to his rescuer and feebly inquired, "Have yes a government here?" "We have," answered the native. "Thin," said the Irishman with increasing strength, "Thin I'm fornist it!"

* * *

THE completion of the Canadian Pacific Railway affords another means of interoceanic communication and should be hailed with pleasure. Our neighbors in Canada have shown commendable enterprise in the matter of railways, and the consummation of their greatest effort in this direction calls for hearty congratuulation from their adjacent and friendly nation.

* * *

AN English contemporary is urging the adoption of third-class sleeping-cars upon British railways, which is rather surprising in view of the fact that first-class sleeping-cars have not yet been generally run by the leading British lines, but, nevertheless, it is gratifying to note that our worthy friends across the water are beginning to lose their dread of American ideas and innovations. Ultimately, we may expect to see the American car the style in general use, and it is a fact that one or two such cars upon English roads have already met with favor.

* * *

IT is comforting to know that the standard gauge is now in almost universal use on American railways, and that the time has nearly arrived when a car may be run upon every mile of railway in the country without a change of trucks.

* * *

AN Irish railway has been boycotted. We rejoice to see that roads across the Atlantic are keeping abreast with the times and are being furnished with all the modern improvements.

"NOTES of Travel in Northern Europe," by the Hon. Charles A. Sumner, congressman-at-large from California in the forty-eighth congress, is the title of an unpretentious but exceedingly interesting little volume recording the author's ramblings in Denmark, Sweden, and other portions of Northern Europe, a year or two ago. The volume is written in a thorough American spirit of inquiry and contrast, and enters into the public and private life characterizing the countries through which the writer traveled, and fully repays a perusal. It is amply illustrated, and is published by Andrew J. Graham, at 744 Broadway, New-York, and is sold for $2.

THE November *Century* is replete with good reading and embellished with the usual amount of artistic engravings. The illustrations accompanying "A Photographer's Visit to Petra," by Edward L. Wilson, and "Living English Sculptors," by Edward Gosse, are—especially the latter—deserving of the highest praise, and a series of brief sketches on "Typical Dogs" is also furnished with numerous spirited illustrations. General Grant's paper on the Chattanooga Campaign is among the many valuable contributions of this number.

EDWIN ALDEN & BRO'S. "American Newspaper Catalogue," for 1885, is a handsome octavo volume of 900 pages, and contains a classified list of all publications in the United States and Canada, together with information concerning the towns of publication and particulars of the journals recorded. The system of cataloguing is simple and the work cannot fail to be of great benefit to advertisers.

CASSELL & CO.'S *Magazine of Art*, for Deeember, is fully up to previous numbers and among other interesting illustrated articles contains a paper on "American Silver Ware," in which, for once, an English writer admits the superiority of American over home talent, in one branch of decorative art. *The Quiver* and the *Family Magazine*, issued by the same house, are excellent numbers.

A NEW journalistic candidate for railway favor is the *American Railroader*, published semi-monthly at 12 Vesey street, New York, at one dollar per year. It is devoted to the interests of "workers" and there is every indication that it will be conducted in a lively and progressive spirit.

THE first issue of *Light, Heat and Power*, the independent gas journal of America, is received. It is published in Philadelphia, and judging by the initial number, which is an admirable one throughout, it will prove a most valuable exponent of the uses of gas.

THE British Institution of Civil Engineers has recently published in pamphlet form an interesting paper by William Stroudley, on the "Construction of Locomotive Engines." An abstract of the discussion following the reading of the paper is appended.

The Cosmopolitan is the title of a new monthly journal published in New York. A number of interesting articles appear in the first numbers, and steady improvement is promised. It is published at 44 Broadway, for twenty-five cents per year,

Outing continues to forge ahead and fully merits recognition as one of the leading monthlies. Its latest issue shows steady and marked improvement, though improvement is rather hard to be imagined as applied to this publication.

The Graphic, published in Cincinnati, the only illustrated paper in the west, is a weekly journal of merit, and is a most creditable publication in both a literary and an artistic sense.

The Cook continues to appear weekly and proves the most appetizing yet tantalizing of publications.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

THE STREET-RAILWAY CONVENTION.

THE fourth annual meeting of the American Street-Railway Association has come and gone, and the street-railway world is the richer for a number of able papers on topics of vital interest and animated and fruitful discussions on matters relating to the construction and conduct of street-railways. Elsewhere we present a brief summary of the proceedings, and as quickly as possible will place in full before our readers the reports of the special committees on the various subjects allotted.

The meeting was a great success as it was bound to be. The attendance was large, the interest in the proceedings lively, and the care and attention of the St. Louis hosts unremitting. Eleven new roads were added to the membership and the financial condition of the association was stated to be satisfactory. Individually and collectively, as far as heard from, there was not an attendant at the meeting who did not feel that he was amply repaid for his presence.

Truly, the career of the American Street-Railway Association has been one continued era of prosperity. In 1882, when the small handful of street-railway representatives organized in Boston, there was no indication of the future success which was awaiting their efforts, but the necessity for the association existed, and while slow at first to acquire membership the street-railways of the country are fast learning that there is a wonderfully fertile field for investment in membership in the association which now numbers one hundred and thirty-seven of the most prominent street-railways in America as members. That this impression is gaining ground there is no doubt, and there is no reason why the next year should not see a still more marked increase in the membership.

The officers elected for the ensuing year are gentlemen well known to street-railway men, and earnest, zealous members of the association. The welfare of the organization can safely be intrusted in their hands. The printed minutes of the meeting will appear in due time as well as the reports of the committees in full. We regret that they are not in shape for us to publish in this issue, but they are of a kind that will keep and their publication will be pushed as rapidly as possible.

It is to be noted that the executive committee have announced that in future no reports, papers, etc., will hereafter be mailed to any persons not members of the association, and this is as it should be. The ridiculously small entrance fee and dues of the association enable any company to acquire membership, and if companies are perversely blind to their own interests and refrain from becoming members, there is no reason why the association should continue to recognize them by sending them the official documents of the association. The existence of the association is now assured, it has been sufficiently advertised, and those street-railway companies desiring to reap benefit from it know what to do.

The choice for a meeting place for next year's convention—Cincinnati—is a good one, and while the fourth annual meeting just passed was in every way a success we look to see it surpassed by that held on October 20th of next year

THE American Street-Railway Association have performed one most commendable act, which they have performed in years past, and which they may be relied upon to perform in years to come if we are not very much mistaken. They have re-elected, as secretary and treasurer, MR. WILLIAM J. RICHARDSON of Brooklyn, and they have done well. To the untiring energy of MR. RICHARDSON is due in great measure the prosperous condition of the association, and under his wise management it is rapidly growing in membership and wealth. He has proved a most efficient officer, and the association have appreciated his services.

THE "BOBTAIL" CAR.

BY A RETIRED OFFICIAL.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE familiar street-car, drawn by one horse and without a conductor, and commonly designated the "bobtail" car, was unknown in my days of active street-railroading. And it is a great pity that we of a former generation did not avail ourselves of this simple means of abridging the expenses of street-railway operation. In our day if expenses had to be lessened we took off several cars and thus diminished the car accommodation—that was the only way we knew of.

The advent of the "bobtail" car put things on a different basis, and through its adoption a street-railway having a steady but comparatively small patronage can offer most liberal accommodation at comparatively small expense. Let us consider the daily savings effected by the "bobtail:" First, the conductor's wages ranging between one dollar and fifty cents and two dollars, and averaging about one dollar and seventy-five cents; second, the care of

one horse, including stabling, feed, etc., amounting to about fifty cents, and third, the saving in capital invested in one horse—averaging the cost of the horse at $150 and his car-life as three years, which is a fair estimate—amounting to about twenty-five cents, or a total daily saving on the three items of $2.50. Now on a street-railway of moderate operation, running twenty cars, here is a a daily saving of $50; no inconsiderable item. It is rare that a road running but twenty cars is burdened with so great a patronage that a "bobtail" car will not hold comfortably all the passengers that will board it, and, therefore on the score of capacity there can be no exception taken.

Now again, a road running say ten cars, which is not uncommon in small cities, by changing their two-horse cars for "bobtails" can effect a saving of $25 per diem, and this saving in expense, if devoted to the betterment of the car accommodation, would add three or four more cars to the regular service and the public would be just so much benefited in their accommodation. A five-mile road operating but ten cars cannot run them at a greater headway than twelve minutes, assuming that the round-trip takes two hours, including stoppages and rests at the termini, which twelve minutes make a pretty long interval between cars. By the adoption of "bobtails," and at no greater expenses of operation, the car service can be increased and cars may be run upon nine or ten minutes headway. It may be urged that the cost of additional cars is not here taken in consideration, but the cost of a "bobtail" is considerably less than that of the ordinary two-horse car, so much so, in fact, that fifteen "bobtails" would cost no more than ten two-horse cars, so this argument falls to the ground.

Now, will some one kindly inform me why, in the light of these incontestable facts, the "bobtail" is meeting with such fierce opposition from the traveling public, and why it is not infrequently the case that their operation is prohibited by city ordinance? By the traveling public it is generally claimed that the deposit of fares in a fare-box at the front of the "bobtail" by the passengers themselves is a nuisance. Well, it may be, but it is certain that devices can be and have been provided whereby the passengers can deposit their fares without leaving their seats, which would entirely obviate this objection. It is further claimed that the driver of the "bobtail," having his attention occupied with the care of his horses, cannot perceive the signals made by persons on the sidewalks. This, I think, is a foolish objection. Beyond the ordinary care necessary to keep his horse in steady motion and to avoid obstacles, the driver can devote his attention to the signals of would-be passengers quite as assiduously as the conductor on the two-horse car, whose time is greatly occupied in passing through the car to collect fares. The driver of the "bobtail" is always on the front platform of the car and has an unobstructed view ahead of him. I should certainly think his facilities for observing the signals of passengers quite as good as those of the average two-horse car conductor.

Altogether it is a mystery to me why the traveling public are so strenuous in their opposition to the "bobtail" system, which enables a road to furnish increased car service without increase of fare, and to furnish an accommodation in a small city quite equal to that in a large city where the daily receipts from passengers are much greater. Perhaps the ungrateful public will and sometimes do appreciate the absurdity of their opposition, when after a city ordinance has been passed restraining the operation of "bobtail" cars their facilities for street-car travel are lessened while they gain nothing. At least one person I know of has admitted that after he had successfully fought the "bobtail" car and its disappearance had been followed by a reduction of the car service on the particular road he patronized, he obtained but one benefit—the realization that he had been a fool; a useful but not comforting realization.

THE FOURTH ANNUAL MEETING OF THE AMERICAN STREET-RAILWAY ASSOCIATION.

THE fourth annual meeting of the American Street-Railway Association was convened at the Southern Hotel, St. Louis, Mo., on Wednesday, October 21st, and remained in session for three days. The meeting was called to order by the President, Mr. Calvin A. Richards (president, Metropolitan Railroad Company, Boston, Mass.), and the following delegates of members were reported present:

Highland Street-Railway Co., Boston, Samuel Little, treas.; J. E. Rugg, supt.

Lynn and Boston Railroad Co., Boston, Philip A. Chase, director.

Metropolitan Railroad Co., Boston, C. A. Richards, pres.; I. Randall, supt. car-construction.

Brockton (Mass.) Street-Railway Co., Horace B. Rogers, supt.; C. J. Kingman, director.

Atlantic Avenue Railroad Co., Brooklyn, N. Y., Wm. Richardson, pres.; W. J. Richardson, sec.

Brooklyn City Railroad Co., Wm. H. Hazzard, pres.

Bushwick Railroad Co., Brooklyn, W. N. Morrison, supt.

Buffalo East Side Railway Co., S. S. Spaulding, pres.

Buffalo Street-Railway Co., Henry M. Watson, pres.

Chicago City Railway Co., H. H. Windsor, sec.; T. C. Pennington, treas.

Chicago West Division Railway Co., James K. Lake, supt.

North Chicago City Railway Co., V. C. Turner, pres. and supt.; Jacob Rehn, vice-pres.; Augustine W. Wright, supt. of track-construction.

Cincinnati Street-Railway Co., A. G. Clark, vice-pres.; John Harris, supt.; Benj. F. Houghton, pur. agt.

Mount Adams and Eden Park Inclined Plane Railway, Cincinnati, G. B. Kerper, pres.

Superior Street-Railroad Co., Cleveland, F. De H. Robison, pres.

Brooklyn Street-Railroad Co., Cleveland, A. J. Moxham, vice-pres.

East Cleveland (O.) Street-Railway Co., H. A. Everett, sec.; G. E. Herrick, director.

Woodland Avenue and West Side Street-Railway Co., Cleveland, J. B. Hanna, sec.; J. F. Card, director.

Columbus (O.) Consolidated Street-Railway Co., A. D. Rodgers, pres.; E. K. Stewart, sec.

Newport and Dayton Street-Railway Co., Dayton, Ky., W. W. Bean, pres. and supt.

Dayton (O.) Street-Railway Co., J. W. Stoddard, pres.; A. W. Anderson, supt.

Oakwood Street-Railway Co., Dayton, O., Chas. B. Clegg, pres.

Denver (Col.) City Street-Railway Co., D. F. Longstreet, director.

Easton (Pa.) and South Easton Passenger Railway Co., H. A. Sage, pres.

Globe Street Railway Co., Fall River, Mass., John H. Bowker, supt.

Hartford (Conn.) and Wethersfield Horse-Railway Co., E. S. Goodrich, pres. and treas.

Citizens' Street-Railroad Co., Indianapolis, Tom L. Johnson, treas.

Jersey City (N. J.) and Bergen Railroad Co., Charles B. Thurston, pres.; E. F. Brooks, engineer.

Lexington (Ky.) City Railway Co., John Cross, pres.

Steinway and Hunter's Point Railway Co., Long Island City, N. Y., Chas. J. Campbell, supt.

Louisville (Ky.) Central Passenger Railway Co., Thomas J. Minary, vice-pres.

Louisville (Ky.) City Railway Co., H. H. Littell, supt.

Lowell (Mass.) Horse-Railroad Co., J. A. Chase, gen. man.

Clinton and Lyons Horse-Railway Co., Lyons, Ia., R. N. Rand, vice-pres.

Memphis (Tenn.) City Railroad Co., R. Dudley Frayser, pres.

Minneapolis (Minn.) Street-Railway Co., Thos. Lowry, pres.; C. G. Goodrich, sec.

Mobile (Ala.) City Railroad Co., John Maguire, pres.; M. Frohlichstein, director.

New Albany (Ind.) Street-Railway Co., Mrs. L. V. Vredenburgh, treas.

Central Park, North and East River Railroad Co., New York, C. Densmore Wyman, vice-pres.; J. L. Valentine, treas.

Dry Dock, East Broadway and Battery Railroad Co., New York, Wm. White, pres.

Omaha (Neb.) Horse-Railway Co., W. A. Smith, supt.

Central City Horse-Railway Co., Peoria, Ill., H. R. Woodward, pres.; Elliot Callender, treas.; Jas A. Smith and Joseph Elders, directors.

Fort Clark Horse-Railway Co., Peoria, Ill., J. H. Hall, pres.

Lombard and South Streets Passenger Railway Co., Philadelphia, John B. Parsons, pres.

Pittsburgh, (Pa.) Allegheny and Manchester Passenger Railway Co., C. Atwell, pres.; J. T. Speer, man.

Pittsburgh (Pa.) and Birmingham Passenger Railroad Co., W. W. Patrick, pres.

Pittsburgh, (Pa.) Oakland and East Liberty Passenger Railway Co., J. T. Gordon, pres.

Union Railroad Co., Providence, R. I., D. F. Longstreet, vice-pres.

Belle City Street-Railway Co., Racine, Wis., Chas. Hathaway, treas.

Rochester (N. Y.) City and Brighton Railroad, Co., C. C. Woodworth, sec.

Saginaw (Mich.) Street-Railway Co., F. G. Benjamin, supt.

Naumkeag Street-Railway Co., Salem, Mass., Chas. Odell, pres.; Wm. B. Ferguson, supt.

Salem (Mass.) and Denver Street-Railway Co., Benjamin W. Russell, pres.; Thos. H. Johnson, director.

Salt Lake City (Utah) Railway Co., Orson P. Arnold, supt.

City Railway Co., San Francisco, Cal., O. W. Meysenberg.

Sioux City (Ia.) Street-Railway Co., F. T. Evans, jr., sec.

Citizens' Street-Railway Co., Springfield, O., D. W. Stroud, pres.

Benton-Belfontaine Railway, St. Louis, Mo., J. G. Chapman, pres.; Chas. Parsons, vice-pres.; Robert McCulloch, sec.

Citizens' Railway Co., St. Louis Mo., Julius S. Walsh, pres.

Lindell Railway Co., St. Louis, Mo., John H. Maquon, pres.; John H. Lightner, vice-pres.

Missouri Railroad Co., St. Louis, Mo., P. C. Maffit, pres.

People's Railway Co., St. Louis, Mo., Chas. Green, pres.

Southern Railway Co., St. Louis, Mo., E. R. Coleman, pres.; W. L. Johnson, gen. man.

St. Paul (Minn.) City Railway Co., Thos. Lowry, pres.

Toledo (O.) Consolidated Street-Railway Co., J. E. Bailey, pres.

Troy (N. Y.) and Lansingburg Railway Co., Charles Cleminshaw, vice-pres.

Delegates from the following new roads acquired membership on behalf of their companies:

Cream City Railroad Co., Milwaukee, Wis., Winfield Smith, pres.

Newburyport and Amesbury Horse-Railroad Co., Newburyport, Mass., E. P. Shaw, lessee.

Kansas City Cable Railroad Co., Kansas City, Mo., Edward J. Lawless, supt.

St. Louis Railroad Co., St. Louis, Mo., Christian Peper, pres.

Washington and Georgetown Railroad Co., Washington, D. C., Henry Hunt, pres.

Cass Avenue and Fair Ground Railroad Co., St. Louis, Mo., W. R. Allen, pres.

Union Depot Railroad Co., St. Louis, Mo., John Scullin, pres.

Dayton Street-Railroad Co., Dayton, O., A. W. Anderson, supt.

South Boston Railroad Co., Boston, Mass., Daniel Coolidge, supt.

Des Moines (Ia.) Street-Railway Co., M. P. Turner, pres.; M. A. Turner, treas.

St. Clair Street-Railway Co., Cleveland, O.; Chas. Hathaway, pres.; M. S. Robison, sec.

Letters were also read from a number of street-railway officials regretting their inability to be present.

The reading of the minutes of the preceding convention was dispensed with and they were adopted as printed, at the conclusion of which President Richards addressed the convention at length, congratulating the association upon its prosperous condition.

The report of the executive committee was then read and adopted. The report stated, among other facts, that the association now numbered one hundred and twenty-five members, an increase of fifty over the number enrolled at the opening of the previous convention, and outlined the work carried out by the committee during the year, together with mention of the new organizations effected for the benefit of street-railways.

The report of the treasurer was then read, showing that the receipts during the year had been $3,212.60 and the expenses $2,471.96, leaving a balance on hand of $740.64.

On behalf of the St. Louis roads, Mr. Julius S. Walsh (president, Citizens' Railway Company,) invited the delegates to attend the Exposition in the evening, and to take a drive through the fair grounds on the following day, and to partake of a lunch, which invitation was accepted with the thanks of the convention.

Reports of special committees were then submitted, on the following subjects:

"Diseases Common to Car-Horses, and Their Treatment," "Progress of the Cable System of Motive-Power," "Progress of Electricity as a Motive-Power," "Repairs of Tracks," "Rules Governing Conductors and Drivers."

These reports, which will appear later in the JOURNAL, were the subject of interesting discussions and the time of the convention was chiefly taken up in the treatment of the important problems they presented.

The report of the special committees on "Ventilation, Lighting and Care of Cars," was not submitted, but the subject was thoroughly discussed.

On the afternoon of the last day the following officers were elected for the ensuing year:

President, Julius S. Walsh (president, Citizens' Railway Company, St. Louis); First Vice-President, William White (president, Dry Dock, East Broadway and Battery Railroad Company, New York); Second Vice-President, C. B. Holmes (president, Chicago City Railway Company); Third Vice-President, Samuel Little (treasurer, Highland Street-Railway Company, Boston).

Secretary and Treasurer, William J. Richardson (secretary, Atlantic Avenue Railroad Company, Brooklyn).

Executive Committee, C. A. Richards (president, Metropolitan Railroad Company, Boston); John Kilgour (president, Cincinnati Street-Railroad Company); John Maguire (president, City Railroad Company, Mobile, Ala.); T. W. Ackley (president, Thirteenth and Fifteenth Streets Passenger Railway Company, Philadelphia); C. C. Woodworth (secretary, Rochester (N. Y.) City and Brighton Railroad Company).

On motion, thanks were extended to the retiring president, and to the secretary and treasurer for their efforts in behalf of the association, to the St. Louis companies for the hospitality extended to the delegates, to the press and to the officers of the fair grounds.

The retiring president then introduced his successor, who addressed the convention briefly, after which the meeting adjourned to reconvene in Cincinnati, on Wednesday, October 20th, 1886.

On Friday evening, the annual dinner of the association was held at the Southern Hotel. The newly-elected president, Mr. Julius S. Walsh, presided, and a number of toasts were drunk with appropriate responses.

A Heavy Street-Railway Mortgage.

THE various street-railway companies of Newark, N. J., now under the presidency of Mr. S. S. Battin, have been consolidated under the title of the Essex Passenger Railway Company, and that company recently placed on file

in the county register's office a mortgage for $1,800,000 to Edward Q. Keasbey and George G. Frelinghuysen as trustees for the bondholders to secure thereon the bonds of the roads. The mortgage covers all the real and personal property, including cars and horses, tracks, franchises, buildings, etc., of the Orange and Newark Horse-Car Railroad Company, including the Clinton avenue, Orange, Belleville, and Market-street lines, and also the same property of the Newark and Bloomfield line, the Irvington line, and the Essex and Hudson Railway Company (the East Newark line).

A Street-Railway in Yonkers.

THERE was a meeting on October 26th of the incorporators of the Yonkers and Mount Vernon Railroad. They made application to the board of trustees for permission to lay their tracks in the village to connect with the road from Yonkers. This is a rival of the Mount Vernon and East Chester Company, and there is every indication of a lively time about it. The Mount Vernon Company have already commenced to build the road and they accuse the new company of attempting to get possession of the streets so as to cut them off. On the other hand the new company claim that all they want is a short connection at West Mount Vernon, but want full power given them in case of need hereafter.

Street-Railways in the Russian Capital.

THERE are now in St. Petersburg 70 miles of street-railway, operating 395 cars, drawn by 2,000 horses and 9 locomotives. The combined lines carry 51,000,000 passengers yearly. The first street-railway in St. Petersburg was constructed in 1873, and the growth of street-railway operation in that city has been marked.

A Singular Title.

THE word "bond" has been put to a curious use in Brazil. "When street-cars were first introduced in Rio de Janeiro by some American capitalist," says a correspondent of the Boston *Advertiser*, "the bonds of the company were first offered on the market. The bonds were floating about and everybody talked of them, but the horse-car, or rather mule-car, did not appear. At last they arrived, soon became popular, and are now known as 'bonds' all through the empire, not merely in Rio Janeiro, but at Para, Pernambuco, Bahia and in all the cities."

A New Form of Car-Wheel.

A NEW form of wheel for street-cars, designed with the object of overcoming the severe friction of the ordinary rigid wheels in passing round short curves, has been under trial at Northampton, Englnnd. The wheel has a loose steel tire working on ball rollers around an inner wheel, which is fixed to the axles in the ordinary way. This loose tire can revolve faster or slower than the inner wheel, thus giving freedom to the wheel which has to travel the outer or longer sweep of the curve. Several gentlemen recently accompanied Mr. Elliott, the manager of the Tramways Company, to witness the experiment, and all agreed in approving the marked difference felt in the movement of the car round curves, and noticed with pleasure the ease with which the horses took corners that have hitherto been a great strain upon them. The wheels were tested as to the brake-power that could be applied. Three men pushed a car out of the company's depot round the awkward curves, while with the old wheels six men are required for the purpose. A great saving is anticipated from the fact that only the steel tires will require renewing, and that these can be attached in five minutes.

STREET-RAILWAY NOTES.

THE certificate of incorporation of the Fifth Avenue Omnibus Company, which proposes to run omnibuses in Fifth avenue and elsewhere in this city. was filed on October 26th in the county clerk's office. Its capital stock is $500,000, divided in 1,000 shares of $50 each. Its incorporators are: Charles E. Lawyer, William C. Mifflin, Francis J. Arend, George G. Crosby, Charles L. Work, Joseph H. Reall, and Edward Vernon.

A STREET-RAILWAY on King street, Charleston, S. C., is the subject which is now engrossing the attention of the leading merchants on that favorite thoroughfare. It is now proposed that some enterprising syndicate shall run a surface line of railway from the west end of Broad street to King, and up King to Calhoun, where close connection will be made with the present King street line.

AT the recent annual meeting of the consolidated elevated railways of New York City it was shown that during the past year 103,354,729 passengers had been carried. The gross income was $7,000,561, and the operating expenses $3,719,492. This showing demonstrates that there have been nearly one hundred passengers for every inhabitant of the city.

CHARLOTTE, GA., is soon to have a line of street-cars propelled by electricity instead of by horses. The line is to be built by a Chicago firm, who will furnish the electric engines to propel the cars. Work, it is said, will soon be commenced.

THE Nahant (Mass.) Street-Railway Company has just been incorporated with a capital of $100,000, for constructing and operating a line of over four miles from the Lynn line to Nahant. Electricity as a motive-power may be used.

THE Citizens' Street-Railway Company, of Memphis, Tenn., has been incorporated with a capital stock of $250,000. Right-of-way has been granted the company for four routes in the city of Memphis.

THE Lincoln (Neb.) Street-Railway Company have commenced laying track on Eleventh street, They will go north to R street and then east on R street, but how far has not yet been determined.

IN the department of New Inventions of this month's JOURNAL will be found the description of an endless-chain railway curve for cable roads.

A STREET-RAILWAY will be built at Seguin, Texas. It is to be one mile and a quarter long, and to extend from the town to the depot.

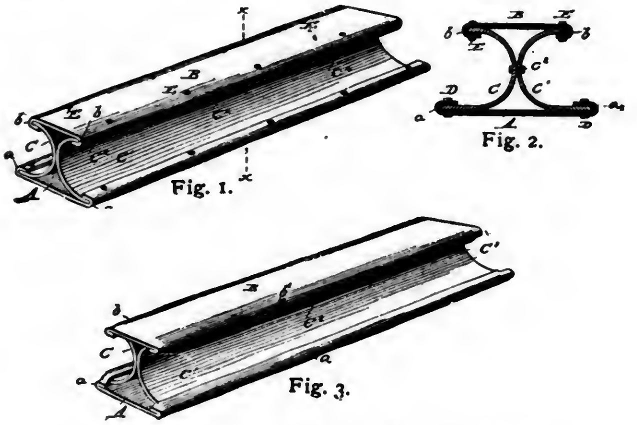
A STREET-RAILWAY company has been organized at Salina, Kan., and the service will be in operation within six months.

New Inventions.

Whipple's Railway-Tie and Rail-Fastening.

LEANDER E. WHIPPLE, of Hartford, Conn., is the inventor of an improved railway-tie and rail-fastening, which is herewith illustrated and described. The invention comprises two devices, the tie and the fastening, each of which will be described separately.

In the accompanying cuts, Figs. 1 to 3, inclusive, refer to the railway-tie. The object of this device is to produce a metallic tie which shall possess the characteristics of cheapness, durability, strength, and elasticity; and it consists in a tie composed of a base-plate and a top-plate



WHIPPLE'S RAILWAY-TIE AND RAIL-FASTENING.

of sheet metal united by intervening plates of curved form in cross-section. Fig. 1 represents a perspective view of the improved tie; Fig. 2 a vertical cross-section on the line *x x* in Fig. 1, and Fig. 3 a perspective view, showing a modified form of the tie.

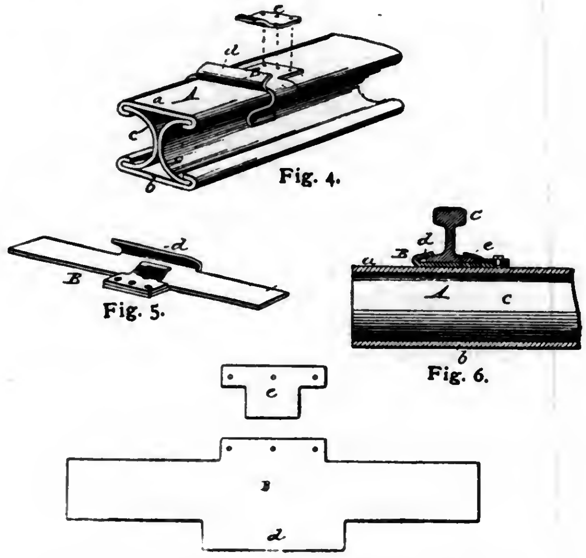
The body of the tie consists of the base-plates A, the top-plate B, and the two body-plates C C′. The bottom plate is constructed in a flat form and of uniform width, and with its two edges curled upward and inward to form lips or flanges *a*. The top-plate B, which is usually of a width somewhat less than that of the base-plate, has its upper edges curled downward and inward, forming lips or flanges *b*. The body-plates C C′, are each of a semi-circular form in cross-section. They are placed together, side by side, with their continuous surfaces bearing against each other, and are seated at their lower edges within the flanges of the base-plate, and at their upper edges within the flanges of the top-plate, as shown in the cuts. It is to be observed that when thus arranged the body-plates are seated and confined firmly against each other, so as to give mutual support and maintain the top-plate firmly in position. The flanges or lips may be compressed with more or less firmness upon the top plate, and, if desired, bolts or rivets may be placed through the edges to confine the parts firmly against movement upon each other, and to prevent them from being accidently disconnected. As shown in the cuts, the rivets C^2, unite the body-plates with each other, while the rivets D and E, unite the edges of the body-plates with the base and top-plates, respectively. The various plates may be made of such size and thickness and proportion as circumstances may require.

In order to provide for slight differences which may occur in the expansion of the several parts, and to prevent the straining or bending of the tie in consequence thereof, the holes through which the bolts or rivets are passed may be slightly elongated in the direction of the length of the tie. In place of using the rivets for this purpose, the top and bottom plates may be extended slightly beyond the body-plates and closed together over the ends of the same as shown in Fig. 3.

While it is preferred to have the body-plates of substantially a semi-circular form in cross-section, they may be made of angular or other form, provided they are adapted to support each other midway of their height.

It is claimed that this tie permits of any desired elasticity, the degree being produced by the variation in the thickness of the metal used, and by the method employed in making the ties, putting them together either closely or loosely. It is further claimed that the bottom-plates A, when buried in gravel or rock-ballast, secure a firm underground hold, thus giving the track solidity and strength.

In the acccompany cuts, Fig. 4 to 7, inclusive, refer to the fastening device, which consists of a plate provided with depending arms or ends to clasp the tie, and with lips upon the top to engage the edges of the rail-base. Fig. 4 is a perspective view showing the fastening device applied to the tie, the separable lip being detached; Fig. 5 a perspective view of the fastening as it appears when viewed from the opposite side; Fig. 6 a longitudinal vertical section of the tie and fastening with the latter in position, and Fig. 7 a top plan view of the blank from which the fastening is formed.



WHIPPLE'S RAILWAY-TIE AND RAIL-FASTENING

A represents the tie, B the fastening device, and C the rail. The tie consists of top and bottom plates *a* and *b*, having their edges curled inward to embrace the edges of intermediate supporting-plates *c*, which are made of concave form and arranged back to back. The fastening device is composed, as shown, of two parts. The main part consists of a plate, such as shown in Fig. 7, made of such length that when laid transversely upon the tie it will project beyond the same on both sides, the extended ends being adapted to be bent downward, so as to engage be-

neath the edges of the tie for the purpose of retaining the device thereon. On one side of the plate there is a projection *d*, which is curled inward and upward, as shown in Figs. 5 and 6, forming a lip to engage over one side or edge of the base of the rail. To secure the opposite edge of the rail, a removable plate *e*, is used, provided with holes to receive rivets, bolts, or other fastening devices by which it is united to the main plate. The inventor has modified the construction of this removable plate *e*, providing it with but two bolt-holes instead of three as shown in the cuts. The bolts come up through the top-plate *a*, of the tie, and are driven into snug-fitttng square holes. In order to remove the rail it is only necessary to remove one bolt and to move the plate *e*, back, when the rail can be at once removed and replaced by the same simple operation.

In making use of this device it is placed on top of the tie and beneath the rail, as shown in Fig. 5, and the ends hammered or otherwise bent into position to clasp the edges of the tie securely. This bending may take place either before or after the application of the device to the tie. After the rail is placed in position the plate *e*, is secured in place. The movement of the fastening lengthwise to the tie may be prevented by extending the fastening bolts or screws downward into holes in the top of the tie, or in any other manner answering the purpose.

As this fastening is constructed of wrought-iron or other ductile metal, its arms may be hammered into proper form to adapt them to the tie, and caused to clasp the latter with an elastic or yielding pressure. This insures a close fit of the parts, and prevents the noise and loosening of the parts which would otherwise result from the passage of trains.

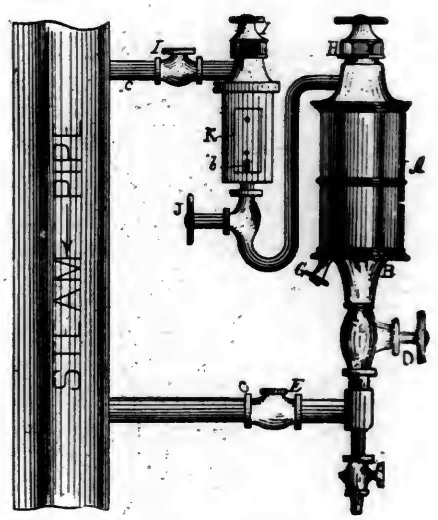
It is claimed by the inventor that with this form of tie and rail-fastening perfect gauge is obtained, since the fastenings are attached to the rails in the shop at the time of manufacture. It is further claimed that in track laying great economy of time and labor is effected in employing the above-described device.

Barclay's Lubricator.

PETER BARCLAY, of East Boston, Mass., is the inventor of a lubricator for all classes of machinery, which is herewith illustrated and described. The inventor has taken out several patents upon his device, and the description relates to it in its most recent form.

This invention provides a lubricator for locomotive, marine, and other steam-engines in which the oil is applied by the pressure of the steam, and is fed in a fine stream, or drop by drop, through a glass or glazed chamber, either directly when the feed is a downward-drop one, or indirectly through a fluid therein of different specific gravity when the feed is an up one. In this lubricator the steam is condensed in the lower portion of the oil-cup, or receptacle or chamber connected therewith, by an intercepting perforated device, and the oil expelled from the cup, through the pressure of the steam, by the rise of the water of condensation on which the body of oil in the cup floats. In its improved form, however, which is here described, instead of an intercepting perforated plate, a perforated coil is used whereby a greatly-increased condensing surface is obtained. When the lubricator is a downward-drop one, a perforated diaphragm is also arranged in or near the bottom of the glass tube or indicator, whereby the oil is restrained from being spattered or thrown back up the glass by the pulsations of the steam in the engine, and especially at starting the engine. The invention also includes a tubular bracket for carrying the lubricator and for conducting the oil to its place of discharge in the engine or pipe connected therewith, whereby the attachment of the cup is facilitated.

The accompanying cut shows the device in sectional outline, and also its application. A indicates the cup or oil receptacle of sectional construction as regards its body and bottom, and fitted internally with a lower horizontal tubular coil B, having numerous perforations throughout its length. This perforated coil B, is extended downward at its center through the bottom of the cup, where it is secured, and open below, while its other or outer end is



BARCLAY'S LUBRICATOR.

made solid or closed. This perforated coil, through which the steam from the steam-pipe circulates and is condensed in the lower portion of the cup, takes the place of the perforated plate before referred to, to give a diffused pressure on the oil, and, besides being generally superior thereto, will give a very much more extended condensing-surface than is attainable by a mere perforated plate, thus greatly adding to the efficiency of the lubricator. The steam is passed to the cup, below the coil, from any convenient place—as, for instance, from the boiler-dome, steam-pipe, valve-casing, etc.—up to and through the coupling C, and thence down through suitable connections provided with a valve D, for regulating the supply of steam to the cup, and with a check-valve E, to the coil B.

G is a cup-drain, and H a filling-cap to the cup; I a check-valve in the oil-discharge pipe from the cup, and J a hand regulating-valve for controlling the discharge of oil to the engine, or, rather, through a nozzle *b*, to the glass indicator-tube K.

This device is claimed to be simple in mechanism, durable, to work regularly by steam-pressure, and in any climate. It is now successfully employed on the *Etruria*, *Umbria*, *Aurania*, and a number of other fast ocean steamers.

Mershon's Valve-Oiler.

SAMUEL D. MERSHON, of Rahway, N. J., is the inventor of an improved valve-oiler, which is herewith illustrated and described. As constructed the oiler has its jointed discharge-rod connected with a crank-pin attached to a screw-wheel meshing into an endless screw, the shaft of which is provided with a pulley to receive a driving-band, whereby the oiler will be made to discharge oil with certainty at regular intervals of time.

In the accompanying cuts, Fig. 1 is a front elevation of the oiler, part being broken away; Fig. 2 a scctional side elevation of the same, taken through the line *y y* in Fig. 1, and Fig. 3 a sectional plan view of the tube and the discharge-rod, taken through the broken line *x x x x* in Fig. 2.

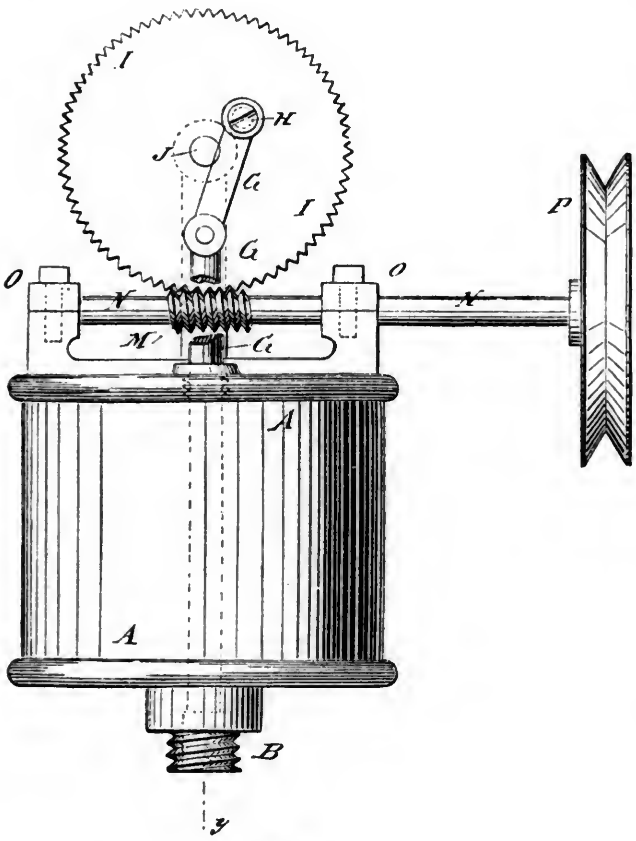


Fig. 1.

MERSHON'S VALVE-OILER.

A represents the oil reservoir or cup, through the center of which passes a tube B. The tube B, may be formed solid with the top of the reservoir A, and screwed into a screw-hole in the bottom of the reservoir, or secured in place in any other suitable manner. Oil is introduced into the reservoir A, through an opening in its top, which opening is closed by a screw-plug C, having a perforation D, formed through it to admit air to the reservoir to take the place of the oil as it is discharged.

In one side of the tube B, is formed an opening E, through which oil can pass into the interior of the tube and enter the recess or pocket F, formed in the side of the rod G, and fitted accurately into the tube. The pocket F, is formed in such a position as to come opposite the opening E, when the rod G, is raised, and thus become filled with oil. As the rod G, moves downward, the oil in the recess F, is carried with it and flows out through the lower part of the tube B, to the surface to be oiled. The bore of the lower part of the tube B, is enlarged or made eccentric from its lower end to the point opposite the recess F, when the rod G, is at the lower end of its stroke, as shown in Fig. 2, so that the oil can flow out of the recess F, freely. The upper part of the rod G, is jointed, and its upper end is pivoted to a crank-pin H, attached to the screw-wheel I, the journal J, of

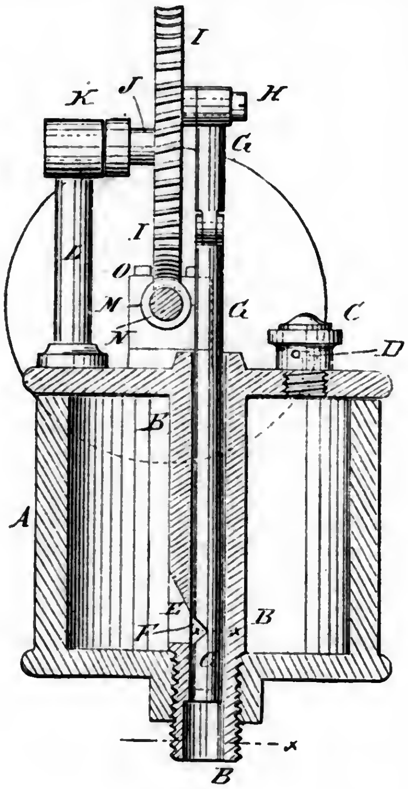


Fig. 2.

MERSHON'S VALVE-OILER.

which revolves in a bearing K, attached to or formed in the upper end of the standard L, attached at its lower end to the top of the reservoir A, so that the rod G, will be moved down and up at each revolution of the screw-wheel I, and will thus discharge the contents of the recess F, to the surface to be oiled at each of the revolutions. The teeth of the screw-wheel I, mesh into the threads of an

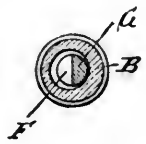


Fig. 3.

MERSHON'S VALVE-OILER.

endless screw M, formed upon or attached to the shaft N, which revolves in bearings O, attached to the top of the reservoir A. To one end of the shaft N, of the endless screw M, is attached a pulley P, to receive a band passing around the shaft of the engine or some other convenient revolving part of the machinery. The amount of time

between the successive discharges of oil can be regulated by increasing or diminishing the number of teeth in the screw-wheel I, or by using a smaller or larger pulley P.

It is claimed for this device that it is simple, efficient and economical, a saving of fifty per cent. of oil being effected; that it gives a positive and regular feed, and is readily attached and requires no attention other than filling; that the flow of oil increases and diminishes with the speed of the machinery, and that the device is durable and not liable to derangement.

The inventor also has a former patent upon the oiler, in this case it being arranged with a ratchet-wheel operated by a pendulum that is kept in motion by the reciprocating motion of an engine or similar machine.

Fischer's Car-Axle Box.

JOSEPH FISCHER, of Elizabeth, N. J., is the inventor of an improved self-feeding journal-box for car-axles, which is herewith illustrated and described. The object of the invention is to provide a journal-box so constructed that it continually feeds oil upon the journal, and it consists in the combination, with a journal-box, of a shaft in the same, two rotary pumps on the ends of the shaft, and a pulley between the pumps, which pulley is revolved by the axle, thus operating the pumps, which deliver the oil upon the journal.

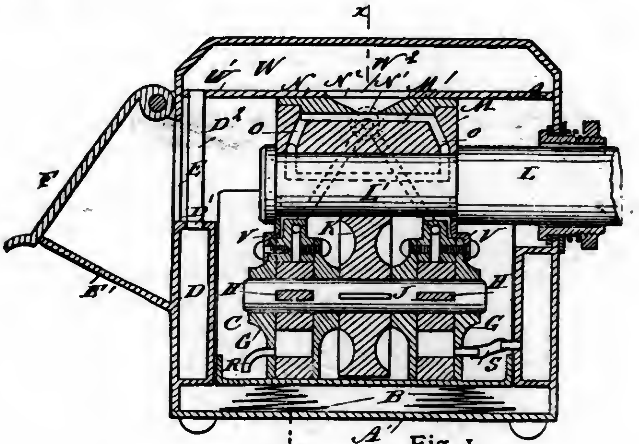


Fig. 1.

FISCHER'S CAR-AXLE BOX.

In the accompanying cuts, Fig. 1 is a longitudinal sectional elevation of the journal-box, and Fig. 2 a cross-sectional elevation of the same on the line x x in Fig. 1.

The journal-box A, is provided with the removable bottom A', upon which springs B, rest, which carry a smaller box C, fitting quite snugly within an oil-chamber D, formed on the inside of the journal-box. The journal-box A, has an opening E. at which a cup E', projects from the end of the box, which cup can be closed by a hinged door F. An oil-chamber W, is formed in the upper part of the box A, by a partition W', having an aperture W^2. A pipe D^2, conducts the oil down into an oil-chamber D, which has an opening D', in its top at any suitable place for securing the lower end of the tube D^2. In the case shown the opening D', is at the opening E.

On the bottom of the box C, two rotary pump-frames or casings G, are placed, the piston-plates H, of which are mounted to work in the ends of a shaft J, journaled in the casings and carrying a pulley K, between them, which pulley is in contact with the journal L', of the axle. On the journal L', a block M, rests, which has a cavity M', in its top, in which a plate N, is placed, having a central aperture N', and a cavity N^2, in its top, which cavity decreases in diameter towards the bottom. The block M, has channels O, for conducting the oil, etc., from the cavity M', to the journal L', and a channel P, for conducting the oil into the cavity M'. The oil can pass from the cavity N^2, through the aperture W^2, in the chamber W.

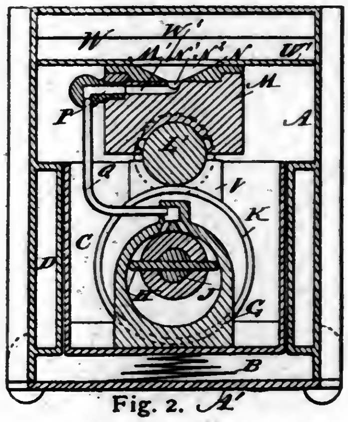


Fig. 2.

FISCHER'S CAR-AXLE BOX.

The oil is conducted from the pumps G, into the channel P, by two pipes Q, united at their upper ends. One pump is provided with a tube R, for drawing oil from the bottom of the box C, and the other is connected by a flexible pipe S, with the oil-chamber D. On the pump-frames two pieces V, are held to project upward, and have semi-circular recesses in their top edges for receiving the journal L'. When the axle swings more or less in the horizontal, the entire pump mechanism swings with it on the bottom of the box C, and the above-mentioned pieces V, are provided to hold the axle in such a manner that it will cause the pumps to swing with it.

The operation of the device is as follows: The pulley is revolved from the journal L', and as the pump-pistons are on the same shaft with the pulle they are revolved also, and thus the pumps are operated as long as the axle revolves. One pump pumps the oil from the tank or oil-chamber D, through a pipe Q, into the cavity in the top of the block M, and from this cavity the oil flows upon the journal, and the excess of oil which is not taken up by the journal passes out through the channels in the block M, through the openings N' and W^2, into the chamber W, and through the pipe D^2, into the chamber D, from which it is pumped again. The oil that drops from the journal is collected in the bottom of the box C, and is pumped up through the pipe R.

The inventor claims this device to be simple, durable and efficient.

Wolcott's Dumping-Car and Car-Dump.

ANSON WOLCOTT, of Wolcott, Ind., is the inventor of an improved railway dumping-car, with dumping mechanism, the construction and operation of which are shown in the accompanying cuts and description. The invention is designed to furnish a means for unloading grain, coal, ores and other freight, from platform, gondola, or box-

cars. and it is covered by two patents, one for the car and the other for the dumping mechanism. Figs. 1 to 6, of the cuts, inclusive, refer to the car, and Figs. 7 to 13, inclusive, to the car-dump.

Fig. 1 is a side elevation of a closed or box-car embodying the improvements; Fig. 2, a transverse section of the same, taken upon line *x x* in Fig. 1; Fig. 3 a fragmentary side view of a flat car, showing one end thereof. Fig. 4 a detail sectional view of the parts shown in Fig. 3, taken upon the line *x x*; Fig. 5 a detail section taken upon the line *y y* in Fig. 3, and Fig. 6 shows a side door constructed to slide vertically.

A means for sustaining the hinged side of a flat car is shown in Figs. 3 and 4. In this case the hinged sides or flaps B, are pivotally connected at their upper ends with posts or standards E, fixed in the car-platform adjacent to the inner faces of the flaps. The sides or flaps B, are in this case constructed with vertical bars *b'*, in the same manner as before described, and the posts E, are provided upon their upper ends with castings *e*, provided with lugs or ears, affording bearings for the pivots of the hinges *b*, of the flaps. The means for locking the flaps shown in the cuts are similar to those before described. The box-car shown is provided with the usnal central doorway at

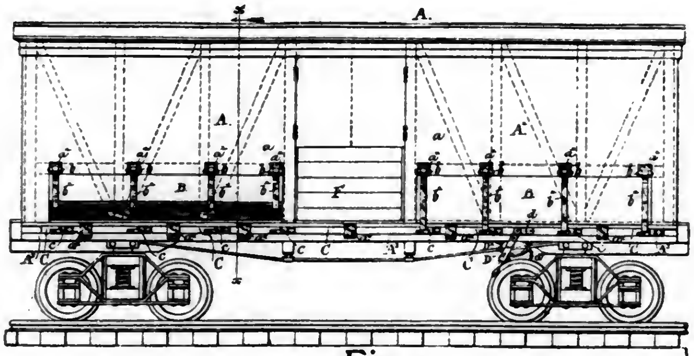


Fig. 1.

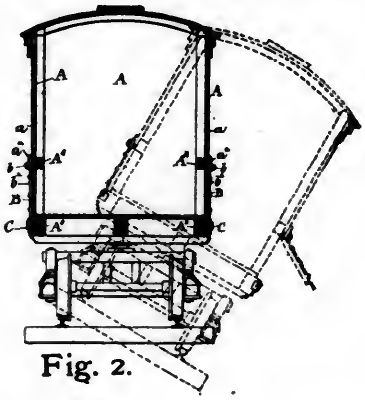


Fig. 2.

WOLCOTT'S DUMPING-CAR AND CAR-DUMP.

A is the car body of any usual or preferred construction, and B B are hinged wall-sections or flaps, which are connected at their upper margins by hinged or pivotal connections *b*, with the car-frame or suitable supports thereon, and are adapted to open upward to permit the free discharge of the contents of the car. In Fig. 1 a box-car is shown, having its stationary side walls, A', extended to within a foot and a half or two feet of the floor thereof, and provided with wall-sections B B, hinged at

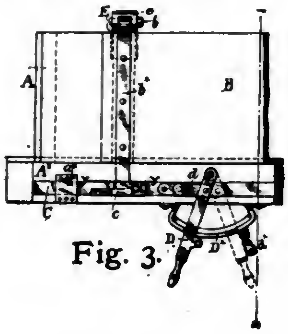


Fig. 3.

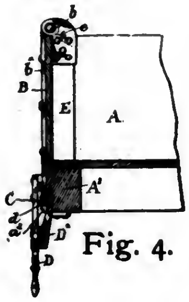


Fig. 4.

Fig. 5.

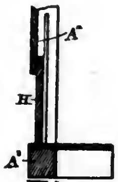


Fig. 6.

WOLCOTT'S DUMPING-CAR AND CAR-DUMP.

their upper edges to the stationary walls, and arranged to close the longitudinal opening or passage between the lower margins of the stationary walls A' A', and the car-floor. The hinged parts B B, in the case of a box-car, may embrace the entire thickness of the car-wall, or may include the outer sheathing or planking only. The latter construction is shown in the cut.

the middle of each of its sides, and its flaps B, are constructed to extend from points at either side of the doorway to the ends of the car, a low or half door F, such as is usually used in grain-cars, being shown as in place within the doorway to retain the load.

In Fig. 2 the car is shown in dotted lines as inclined or tilted sidewise, so as to discharge the load by the opening of the flaps B, as will occur when the car is used in connection with the dumping apparatus which will next be described.

The object of this latter invention is to provide a track-dump which may be used for any kind of railway-cars and for any number of such cars it may be desired to handle at one time, and which also may be applied at any point in a railway-track, so that cars may pass over it when it is not used as a dump, and so that the car or cars, after being dumped, may move over it to an adjacent stationary part of the track so as to allow the approach to the dump of other cars on the same track, It consists of a part or section of track pivoted to rotate upon a longitudinal axis, so that it may be tipped laterally or sidewise together with the car or cars resting thereon, whereby the load may be discharged by gravity from the cars, This particular feature of the invention may be carried out in a number of ways which will readily suggest themselves to a practical mechanic. In the particular form of device as here shown, as one way of carrying it into practice a section of the track-rails, of suitable length, is carried upon a rigid frame formed by suitable longitudinal and cross girders, this frame being provided with trunnions or journals mounted in bearings upon the adjacent ends of the stationary track structure, the frame being suitably placed to permit the load to be discharged from the cars upon the dump into wagons, other cars, vessels, bins, or other receptacles, or upon the ground.

Figs. 7 to 13, inclusive, show the operation of the device. Fig. 7 is a side elevation, partly in central longitudinal

section, of one form of a track-dump; Fig, 8 a transverse section of the same, taken upon the line x x in Fig. 7; Fig. 9 a side elevation of another form of the track-dump; Fig. 10 a transverse vertical section of the same, showing the end of the pivoted frame or platform, taken upon the line x x in Fig. 9; Fig. 11 a transverse section through the stationary part of the track-supporting structure, looking toward the dump, taken upon the line y y in Fig. 9; Fig. 12 a detail transverse section through the dump-frame or platform, taken upon the line z z in Fig. 9, and Fig. 13 a transverse detail section, taken upon the line x' x' in Fig. 9, illustrating the construction of a bearing or support at the middle of a long dump-frame.

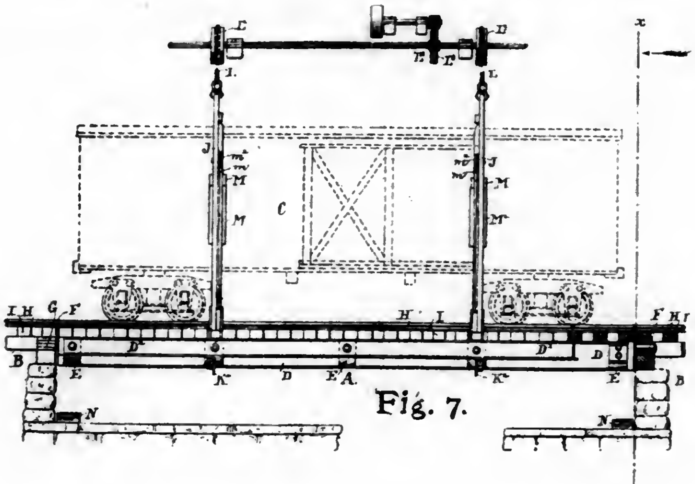


Fig. 7.

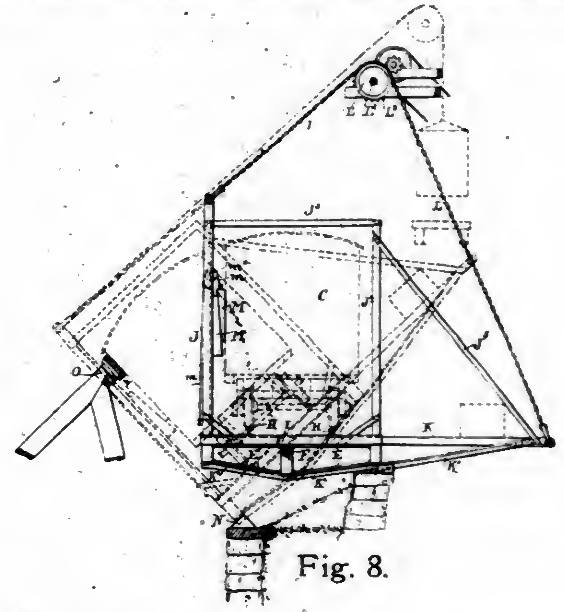


Fig. 8.

WOLCOTT'S DUMPING-CAR AND CAR-DUMP.

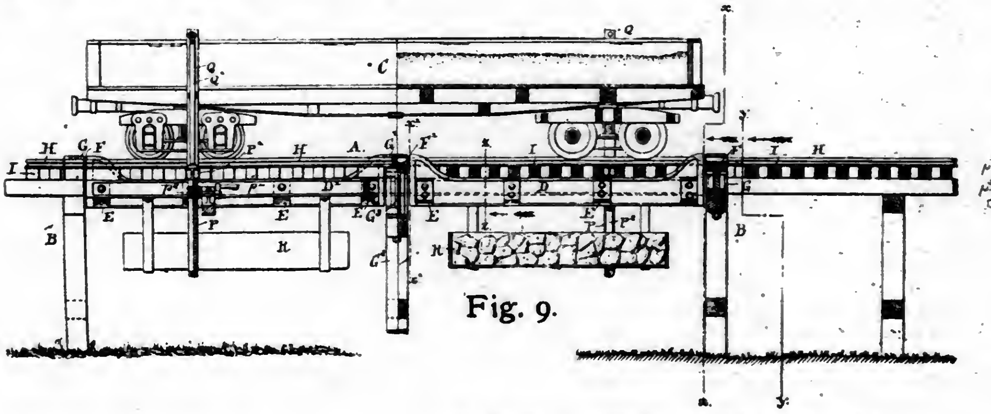


Fig. 9.

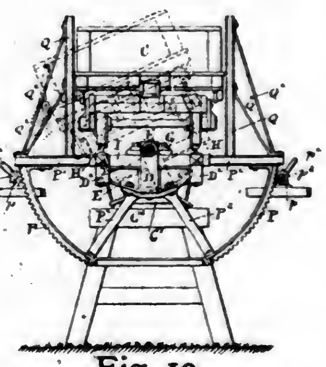


Fig. 10.

WOLCOTT'S DUMPING-CAR AND CAR-DUMP.

A is the dump-frame as a whole. B are portions of the track structure adjacent thereto, and C is a railway-car shown as resting upon the frame. The form of the device illustrated in Figs, 7 and 8 is more particularly adapted for box-cars, such as are used in carrying grain, the intention being in this case to tip or tilt the car at such an angle that the grain, or the greater part thereof, will be discharged through its door. The main part of the frame or platform is, as shown in the cuts, formed of a central longitudinal beam or girder D, longitudinal side girders D', and cross-pieces or brackets E, connecting the middle with the side-girders, the frame thus formed being pivotally supported at its ends by journals or trunnions F, held in suitable bearings G, sustained upon suitable cross-timbers of the stationary track structure B. The track-rails H, are shown as supported upon cross-ties I, placed upon the longitudinal girders in the usual manner. The form of the dump shown in this cut is intended to tilt in one direction only, to prevent possibility of the dump-frame being accidentally tilted, and to avoid the necessity for the use of locking devices to hold the frame horizontal, The longitudinal girder D, and the trunnions F, are located in a vertical plane at one side of the center of gravity of the frame and cars thereon, so that the frame, unless forcibly moved, will remain in its horizontal position.

Any suitable or well-known device may be applied to the dump-frame A, for the purpose of tipping or tilting it, a preferred device for this purpose being shown in Figs. 7 and 8, in which the frame is provided with one or more vertical and horizontal arms J K, rigidly attached to the frame, and to the outer ends of which are connected suitable ropes or chains adapted to pass over drums or pulleys, which are suitably driven so as to tilt the frame, the arms J and K, preferably being made of considerable length in order to enable the movement of the arm to be controlled by the application of a relatively small amount of power to the chains. As shown in Figs. 7 and 8 the outer ends of the arms J and K, are located at equal distances from the center of rotation of the frame, and a

chain L, is connected at its ends with both of these arms and passes at its middle over a sprocket-gear L', which is rotated by suitable actuating devices in either direction in tilting the frame.

In the operation of this device, the outer ends of the arms J and K, are moved to the same extent when the frame is tilted, so that the chain L, will always remain taut over the pulleys L'. The pulleys L', may be supported in any suitable manner, and driven by hand or power, the pulleys, as shown in the cuts, being secured to a shaft L^2, provided with a gear-wheel L^3, to which power may be applied from an engine or other source for moving the dump-frame.

In order to prevent the car from tipping over or becoming derailed when the dump-frame is inclined at a considerable angle, supporting devices are provided upon the dump-frame, against which the side of the car may rest when the frame is inclined. One form of such support is illustrated in Figs. 7 and 8, in which the vertical arms or beams J, are located opposite the sides of the car, and suitable means are provided between the arm and the car for sustaining the latter from the former.

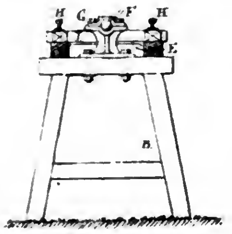


Fig. 11.

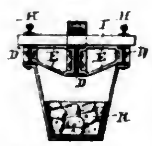


Fig. 12.

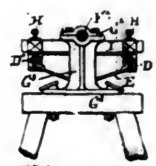


Fig. 13.

WOLCOTT'S DUMPING-CAR AND CAR-DUMP.

The dump-frame shown in Figs. 9 to 13 is constructed with longitudinal girders D and D', and brackets E, and is provided at its ends with the trunnions F, having bearings G, upon the stationary part of the frame, in the same manner as before described. In this case, however, the pivotal axis is centrally located, so that the frame is adapted to tilt in either direction, and the trunnions are shown as located at a point near the level of the rails, and as high as possible without interfering with the parts of the car-trucks, the object of this construction being to bring the axis of rotation as near as possible to the center of gravity of the car and frame, so that the parts will be more nearly balanced, and may be more easily moved when tilted.

A lever or any other suitable means connected with the frame may be used for moving the latter. A simple and convenient device for this purpose is shown in Figs. 9 and 10, consisting of two segmental gears P, located at either side of the frame and connected with the latter by horizontal beams P' and arms P^2, the segmental gears being engaged with pinions p^2, upon a shaft p, mounted upon suitable stationary frames at both sides of the dump, so that the latter may be operated at either slde of the track. The shafts p, may be actuated by power, or they may, as shown, be provided with cranks p', for moving the frame by hand. The beams P', afford a convenient means of attachment for posts or supports Q, for sustaining the car upon the dump when the latter is tilted. These posts are, as shown, located close to the sides of the car, and are attached at their lower ends to the beams P', and made rigid by inclined braces Q', having a footing upon the outer ends of the beams P'.

A dump-frame constructed as above described may be made without a central support—as, for instance, when used for single and short cars—or it may be provided with one or more intermediate supports, as would be necessary in case the frame were designed to hold at once two or more cars. In the form of the device shown in Fig. 9, the beam D, is provided in the middle of its length with a journal F', which has a bearing G', supported upon a suitable frame G^2. It is of course desirable that the entire frame should be perfectly rigid, and for this purpose, in the construction here shown, the girders D', are made continuous from end to end of the frane past the point at which the central girder D, is interrupted or reduced in size to form a journal, as F', at the intermediate point of support of the frame.

In order to balance more perfectly the car and dump-frame upon the pivots or journals of the latter, so that a minimum of power need be used for actuating the dump, a counter-balance weight or weights may be applied in any suitable manner for this purpose. A simple and convenient form of such weight is shown in Figs. 9 and 10, in which boxes or receptacles R, adapted to receive stone or other material, are supported beneath the dump-frame. A similar result may be obtained in the construction shown in Figs. 7 and 8, by locating similar receptacles beneath the dump-frame, or by placing a receptacle containing stone or a weight or weights of other kinds upon the horizontal arm K, as indicated by dotted lines in Fig. 8.

In order to relieve from the posts or arms J or Q, which support the car from lateral movement, a part of the strain to which they would otherwise be subjected, ropes or chains attached to the upper ends of the posts and extending over suitably-located pulleys, may have weights attached to them which will act in opposition to the weight of the car and tend to sustain the frame and return it, when tilted, to its normal position. This construction is illustrated in dotted lines in Fig. 8, in which a platform or support is shown as located beneath the weight in position to receive it when the frame is nearly horizontal, so that the weight will act only when the car is tilted at a considerable angle. A weight such as is above referred to and shown in dotted lines in Fig. 8, may obviously be alone used as a counter-balance, instead of the counter-balance-weights above mentioned in combination with any one of such devices.

By the use of this dumping apparatus one or more cars, as may be desired, can be dumped at the same time by an extended dump track, which may be coupled out to any desired length.

Davis' Electro-Magnet for Signals.

WILLIAM E. DAVIS, of Jersey City, N. J., is the inventor of an electro-magnet for signals, which is herewith illustrated and described. The invention, which may be applied in railway and other uses, consists in combining an electro-magnet with projecting pole-pieces of peculiar form, above which the armature, having a convex lower surface, is adapted to rotate or oscillate. By means of this improved instrument the armature which carries the signal will be turned into one position whenever the circuit is closed, and automatically turned back by a suitable spring into another position whenever the circuit is open,

provided one single electric-magnet is used, while if two magnets are used the position of the signal will depend entirely upon the current that passes through either one of the electro-magnets.

In the accompanying cuts, Fig. 1 is a side elevation of the electro-magnet; Fig. 2 a front view of the same; Fig. 3 a top view; Fig. 4 a side view of a modification of the same, and Fig. 5 a top view of the modification.

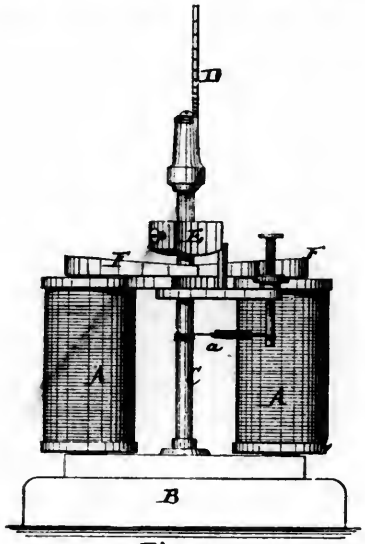


Fig. 1.

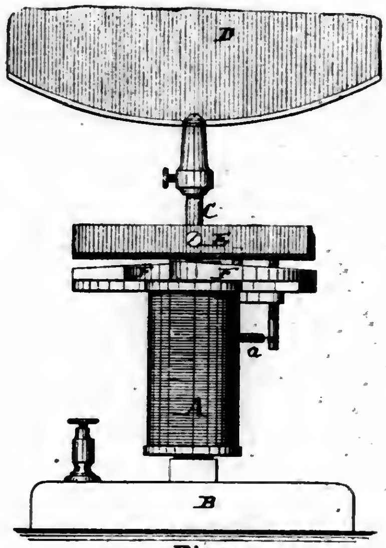


Fig. 2.

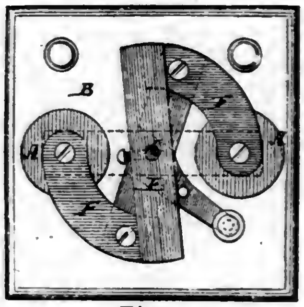


Fig. 3.

DAVIS' ELECTRO-MAGNET FOR SIGNALS.

In the device as shown in Figs. 1, 2 and 3, A represents an electro-magnet fixed upon a suitable stand B, in which stand an upright shaft C, carrying a signal D, is swiveled. This upright shaft carries the armature E, which is a bar having a convex lower face and adapted to extend over the

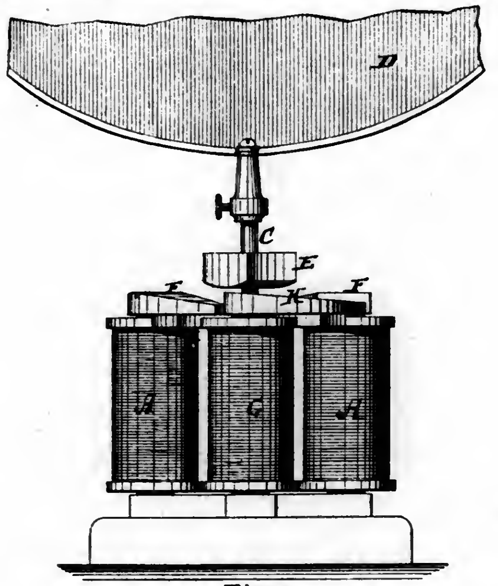


Fig. 4.

DAVIS' ELECTRO-MAGNET FOR SIGNALS.

centers of the two spools of the electro-magnet A, as shown by dotted lines in Fig. 3. To each of the spools of this electro-magnet, at the pole ends thereof, is secured a projecting bar F, of iron or analogous material, which bar has an inclined upper face, so that it is highest near the spool and lowest where farthest away from its spool. A small spring *a*, draws the shaft C, so as normally to hold the armature E, in the position in which it is represented by full lines in Fig. 3, with its ends above those parts of the projecting bars F F, which are farthest away from their respective spools.

When a current is passed through the electro-magnet A, the arms F F, will both be magnetized, and will draw the armature E, toward the spools. The inclined upper faces of the bars F F, coöperating with the convex lower side of the armature E, serve to draw the armature gradually into alignment with the spools, into the position shown by the dotted lines in Fig. 3. As long as the current lasts the armature will remain in this position above the spools. The moment the current is interrupted, the spring *a*, will exert its influence, and will draw the armature F, back into the full-line position which is shown in Fig. 3. The shaft C, may carry a signal D, which, when the current is established, will indicate "danger," and when it is interrupted it will indicate "safety."

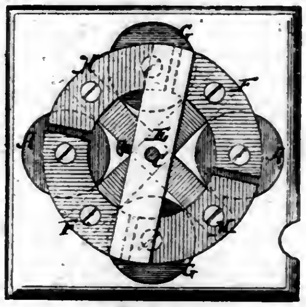


Fig. 5.

DAVIS' ELECTRO-MAGNET FOR SIGNALS.

When the parts are in the position shown by full lines in Fig. 3, the distance vertically between the armature and the arms F, will be greater than when in the position shown by dotted lines line in that figure. The power of the magnet upon the armature is increased as the armature approaches the cores of the electro-magnets.

In Figs. 4 and 5 the invention is represented as duplicated, showing two electro-magnets A and G, of the same kind as the electro-magnet A, which is shown in Fig. 3. The electro-magnet A, of the modification, has the projecting-arms F F, which extend toward the electro-magnet G, and the electro-magnet G, has similar arms H H, which extend to the electro-magnet A.

Bold's Lubricator.

FRED. BOLD, of St. Louis, Mo., is the inventor of a lubricator, which is herewith illustrated and described. The device belongs to that class of lubricators in which the water resulting from the condensation of the steam within the lubricator causes the overflow of oil into a discharge tube.

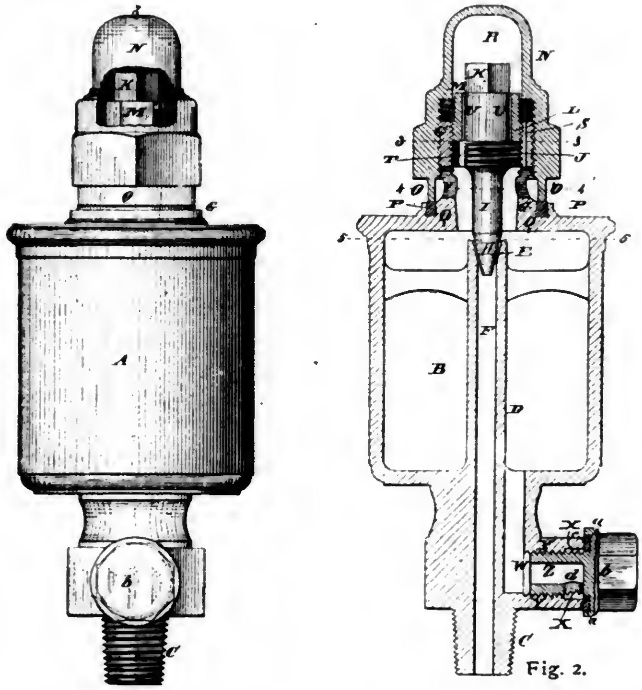


Fig. 1. Fig. 2.

BOLD'S LUBRICATOR.

In the accompanying cuts, Fig. 1 is a side view of the lubricator with part of the screw-cap broken away; Fig. 2 a vertical section at 2 2 in Fig. 1; Fig. 3 a transverse section at 3 3 in Fig. 2; Fig. 4 a transverse section at 4 4 in Fig. 2, and Fig. 5 a transverse section at 5 5 in Fig. 2 with the valve removed.

A is the oil-cup, and B the oil-chamber. C is a screw-threaded nipple, by which the lubricator is secured to the steam-chest, cylinder, or other object. D is a tube extending upward from the bottom of the cup, and having at the top a conical valve-seat E, the bore F, of the tube extending down through the nipple C. G is the tubular neck of the cup, which has interior and exterior screw-threads. The valve H, is formed to fit the seat E. Its stem I, has a screw-threaded part or collar J, working in the female screw of the neck, and an angular top K, to which an adjusting key or wrench is applied to raise or lower the valve. L is a jam-nut, which also works in the female screw of the neck G, and which serves to hold the valve to its adjustment, the bottom of the nut bearing upon the top of the collar J. M is the angular part of the jam-nut, to which the wrench or key is applied to turn it. N is the screw-cap, which turns on the male screw of the neck G, and which has at bottom an annular rim or flange O, bearing, when the cap is screwed down, upon the soft-metal seat P, which is cast in an annular dove-tailed recess Q, made in the top of the oil-cup. It is preferable to form the recess or groove Q, wide enough to allow the annular rim or flange O, to enter the recess as the soft metal wears away.

At the upper end of the screw-cap N, is a steam-condensing chamber R, into which the steam is allowed to enter from the oil-chamber B, and from which the water of condensation returns to the chamber and raises the surface of the oil and causes it to overflow the upper end of the tube D. As a means for this passage of steam and water, a vertical groove S, is shown, cut in the inner side of the neck G, and a passage T, extending through the collar J, and communicating with an annular passage at U, between the jam-nut and the valve-stem. Either or both of these means of communication between the oil-chamber and condensing-chamber may be used, or similar means for these purposes.

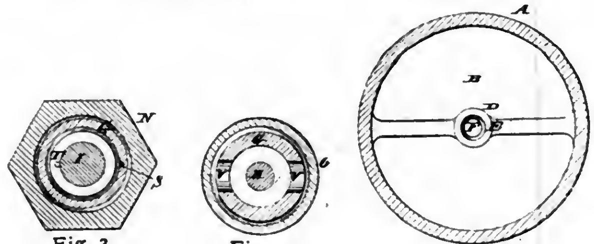


Fig. 3. Fig. 4. Fig. 5.

BOLD'S LUBRICATOR.

V are orifices in the sides of the neck, through which the oil is poured in when the cap has been raised a small distance, the filling being done when there is no steam-pressure within the oil-chamber. W is the waste-pipe, having at the mouth a counter-bore X, and within that a female screw Y, in which works the tubular stem Z, of the plug, by which the mouth of the drain-passage is closed. The face of the flange *b*, of the plug is formed with an annulus *a*, of soft-metal run into a dove-tail annular groove of the flange-head *b*. The annular plug-seat *c*, is preferably made so thin as to enter the dove-tail groove containing the soft-metal facing as the metal of the facing wears away. *d* is an aperture in the side of the tubular stem to allow the escape of liquid from the oil-cup when the plug is opened by turning out the valve-stem a short distance.

It will be seen that as in discharging it is not necessary to remove the plug-stem Z, from the discharge-mouth, so it is not needed in filling the oil-chamber to remove the cap N, from the neck G, it being only necessary to remove the cap to allow adjustment of the valve H.

As shown in the cuts, the body of the lubricator is cast in one piece, but the inventor does not limit the device to this form of construction.

It is claimed for this lubricator that it is simple, inexpensive and efficient, that there are no wooden handles to work loose and fall off, that there are no small glands to pack, no joints to leak, and that once filling the feed it is kept regularly in operation,

The device is now controlled by the inventor and by William M. Stanton, of St. Louis, to whom one-half the patent-rights have been assigned, and to whom all communications should be addressed.

Gidley's Endless-Chain Railway Curve.

ROBERT GIDLEY, of Washington, N. Y., is the inventor of an improvement in the construction of endless-chain railways, which is herewith illustrated and described. The chief object of the invention is to provide, in con-

nection with means for driving the cable, a cheap and simple means for conveying the cable around curves in the line of track.

In the accompanying cuts, Fig. 1 is a plan view showing the cable with both the idle and drive-pulleys attached, the covering being partly broken away; Fig. 2 an inverted plan view of the same; Fig. 3 a view of a side elevation, partly broken away to show the operating mechanism, and Fig. 4 a cross-sectional view.

A is the frame or bed for supporting the track, which may be of any approved construction, and arranged above or under ground, and at a sufficient height for the introduction of the operating mechanism, and *a* is a slot for the passage of the grip to the cable; but instead of this slot there may be a space the entire width of the track, to permit of the cable being gripped by the clutch.

At one end of the track or curved portion—such as B—is arranged a circular series of vertical shafts *c*, which are respectively provided with an idle-pulley D, grooved, as shown, to receive and support the cable *d*. The opposite end or curved portion E, of the track is provided with the drive-pulleys, there being one arranged about midway of the curve F—such as *e*—and one at each side thereof—such as *f g*—the whole being arranged somewhat at a triangle with relation to each other. Arranged in a semi-circle alternately with the drive-pulleys *e f g*, are idle-pulleys *h*, of a construction similar to those at the opposite curved portion of the track, for supporting the cable.

The drive-pulley shafts are respectively provided with a horizontal fixed bevel gear-wheel G, and are connected together by means of the short horizontal shafts H, and miter-gears I, the shafts being supported in suitable bearings *i*, to the frame or bed. One of the drive-pulley shafts may be of greater length than the other two, and provided at its lower end with a fixed band-wheel or bevel gear L, by which motion may be received from any suitable mechanical motive-power and imparted to the connecting-pulleys and the cable.

It is claimed by the inventor that by the use of this construction the cable may be conveyed around curves in a simple and satisfactory manner.

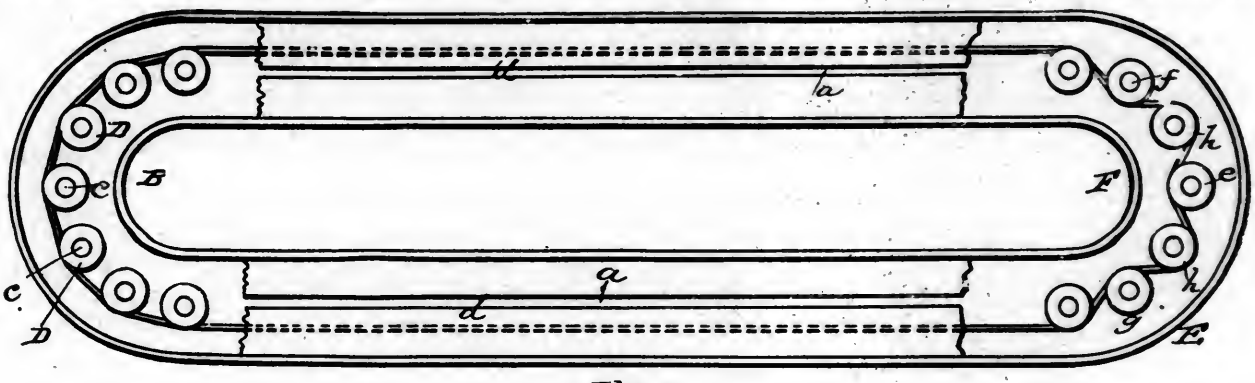


Fig. 1.

GIDLEY'S ENDLESS-CHAIN RAILWAY CURVE.

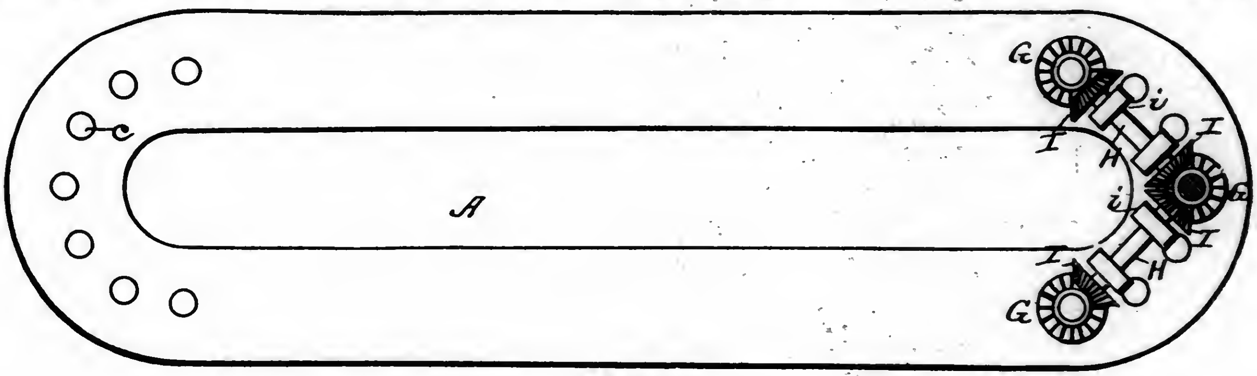


Fig. 2.

GIDLEY'S ENDLESS-CHAIN RAILWAY CURVE.

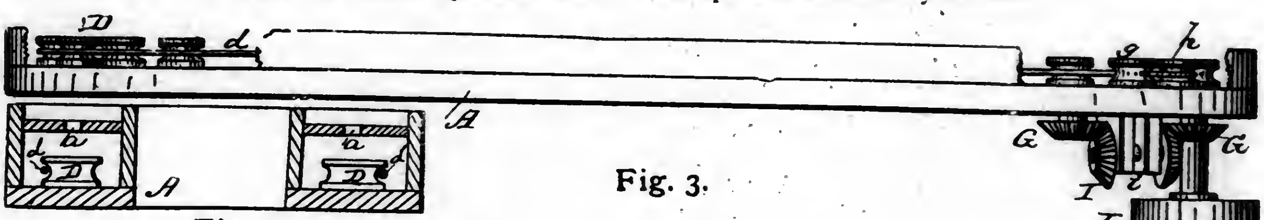


Fig. 3.

Fig. 4.

GIDLEY'S ENDLESS-CHAIN RAILWAY CURVE.

Hascy's Rail-Joint.

ALONZO HASCY, of Brooklyn, N. Y., is the inventor of a rail-joint which is herewith illustrated and described. It is designed to furnish a joint for railway rails that will prevent the lamination of the rails at their ends and also the jarring and noise created by the passage of the car-wheels over the joints.

In the accompanying cuts, Fig. 1 is a plan view of two rails joined by the device; Fig. 2 an end view of a rail prepared for the application of the device, and Fig. 3 a view of the dowel-bolt used in effecting the joint.

The dowel-bolt A, is cylindrical in form, and provided with a web *a*, this web having straight sides and circular

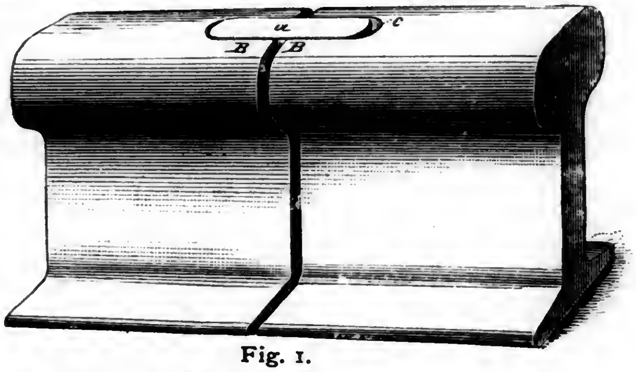
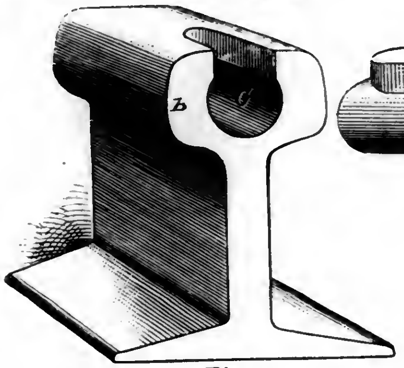


Fig. 1.



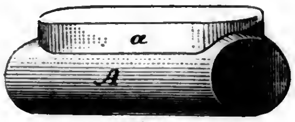


Fig 3.

Fig. 2.

HASCY'S RAIL-JOINT.

ends, as shown in Figs. 1 and 3. B B are adjacent ends of two rails, each of which is provided with a recess C, adapted to conform to the curvature of the dowel-bolt A, and web *a*, as shown in Fig. 2. It will thus be seen that when two rails provided with these recesses C, are laid with their ends slightly apart to make provision for expansion, as shown in Fig. 1, and the dowel-bolt is inserted in the recesses, a firm joint is made, and a bridge is provided between the rail ends over which the car-wheels may run without crushing or injuring the rails in any manner, and without the concussion and rattling common to the passage of car-wheels over the joints of rails.

It is claimed that this device is simple, that the dowel-bolt is effective in its operation, and that no screws or bolts are required to hold it in position. The device is also applicable to street-railway rails.

RIEHLÉ BROTHERS, proprietors of the Philadelphia Scale and Testing Machine Works, have recently received the following orders: Two testing machines, from Lawrence Scientific School, Harvard University; one testing machine, from the University of Wisconsin; one testing machine, from the American Screw Company, Providence, R. I.; one cloth tester, from Messrs. Wm. Ayers & Sons, Philadelphia; one marble molding machine, from A. Klaber & Co., New-York; one marble molding machine, from Messrs. Buess & Co., New York; one marble molding machine, from H. C. & G. S. Bailer, New-York; one charging scale, to Robert. H. Coleman, Cornwall, Pa.; one charging scale, to Fisher, Ferguson & Co., Colebrook, Pa.; two special pig metal scales, for Glendon Iron Company, designed by Mr. Frank Firmstone, superintendent; also large scales to Repanno Chemical Company; Wilson & Fennimore, Bristol; Maiden Creek Iron Company; Mont Alto Iron Company; Huff, Fontaine & Abbott. In addition to the above, their orders for portable platform and counter scales, trucks and other specialties, have been brisk, and they are now busier than they have been for months. They regard these orders, coming from so many branches of trade, as an index of approaching prosperity.

ATTENTION is directed to an advertisement in this issue calling for the construction of a railway in Astoria, Oregon. Liberal inducements are offered.

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GEO. P. ROWELL & CO.,
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10 Spruce Street,
NEW YORK.

American Railroad Journal.

WHOLE NO. 2,571.] NEW YORK, DECEMBER, 1885. [VOLUME LIX.—No. 9.

CONSOLIDATED, MOGUL AND EIGHT-WHEEL FREIGHT-ENGINES.

BY FRANK C. SMITH.

[Written for the AMERICAN RAILROAD JOURNAL.]

OF late years in this country the consolidated and mogul types of locomotives for freight-service have largely displaced the ordinary eight-wheel or American type of engine. It was argued in their behalf that as they would pull from a half more to twice as many cars as the eight-wheel engine, marked economy would result in the saving of engineers', firemens', conductors' and train-hands' wages. If, when these heavy engines were adopted, the framing and especially the draft-rigging of freight-cars had been strengthened in proportion as the trains were enlarged, a large drawback for repairs to these parts, damages for injured freight caused by cars being side-tracked on the road and left on account of having the "whole end pulled out," would not have decreased and in many cases have entirely over-topped the saving in wages, etc. With the advent of these heavier engines came the increasing of the capacity of cars with the "marking brush." That is, cars built and marked to load to 10 or 12 tons, were made capable of hauling 15, 16 and 18 tons. Thus the enlarged trains, with the heavier loads per car, aided in racking and destroying many thousand of very serviceable cars.

Another offset to the claimed economy of these heavy engines arose from the fact that on many roads for but short portions of the year could sufficient cars be found to make a proper load for them. That is, in many cases freight would fall off so that but from 15 to 20 cars would be ready for a train, and as these heavy engines cost from ¾ to 1½ cents per mile more for fuel, and from 1 to 2 cents per mile more for repairs, another item to offset their economy arises. In addition to this they are much harder on curves, frogs, switches, etc., not because they have more weight per wheel than the eight-wheel engines, but because the gross weight, or the weight per foot of the length of the engine, is greater, and to correct this it was on many roads found necessary to reduce the speed per hour from 15 or 20 miles to 10 or 12.

Experiments have been made to determine the friction of the eight-wheel, ten-wheel and consolidated type of engines in passing around curves, by hauling them dead, behind a dynamometer-car, with the result of showing that the eight-wheel engine required a pull of 1,963 pounds, the consolidated 1,850, and the ten-wheel 1,750 pounds. It was objected that this was not a fair test, inasmuch as the action of an engine *propelling itself* and being hauled was widely different, and this is undoubtedly the case, as there should be no difference between an eight and ten-wheel engine, of the same total wheel-base, provided the leading pair of drivers of the ten-wheel engine are "blind" or without flanges. But, as before stated, the destructive features of the different classes of engines is to be found in their weight, as it is plain that an engine weighing from 5 to 10 tons and upwards more than another, must necessarily tend to straighten out a curve more, both striking it at the same speed.

The average mogul engine in use in this country has 18 x 24-inch cylinders with about 66,000 pounds on the six drivers, or 11,000 pounds per wheel. The design of the mogul grew out of the supposed limit per wheel of 12,000 pounds, it being believed that to exceed this would cause the wheel to crush into and destroy the rail. But like many other popular beliefs a little practice dispelled it, since the limit per wheel has largely increased, as the Pennsylvania road is using 16,250 pounds per wheel, the Reading road 17,000 pounds, and 22,000 pounds per wheel has and is successfully used as a shifting engine. It appears from this that an eight-wheel engine may be built having 17,000 or 18,000 pounds per wheel, with the same size of wheel and cylinder, and thus be as powerful as a mogul of the same size, with the additional features of being cheaper to build at first cost, cheaper to keep up, and cheaper for fuel. Of what necessity, then, is the mogul engine, since if the tractive force due to 18 or 19 inch cylinders is sufficient for all present needs of our roads, the weight per wheel on an eight-wheel engine will not prove injurious to modern rails. In proof of this I may cite the case of a road which had been stocked with comparatively light engines—10,000 pounds per wheel. In the course of time, this road absorbed several branches and built others, which were in a much more level section of country than the original or main line. The light main line engines were sent on these divisions, and their places filled with heavier engines having 16,000 and 17,000 pounds per wheel. The result was that the track and tires showed much less wear, this being due to the decrease of the imperceptible slip which is going on constantly between the wheel and rail. That the decrease of imperceptible slipping accounted for this correctly cannot be doubted. The writer, to determine the amount of slipping, placed a revolution counter on a 17 x 24 eight-wheel freight-engine. The distance the engine would advance by one revolution of the drivers was ascertained by marking the tire and rail when the tire rested on the rail. The engine was then pushed ahead until the mark came fair to the rail again, and the rail marked. The distance on the rail between these two marks gave the distances the engine moved in one revolution. The engine was then coupled to a train and run over a measured piece of track 12 miles long, and not a perceptible slip occurred in the 12 miles. The distance the engine should have advanced, found by multiplying the number of revolutions shown by the revolution-counter by the distance moved in one revolution, gave 13.8 miles, thus

proving that an imperceptible slip of 1.8 miles had occurred while the engine had actually moved but 12 miles. And it may be taken as a fact that all engines having but this proportion of weight to the cylinder slip imperceptibly a similar amount. No one would question the great wear which would occur if the wheels of an engine were chained to the frame and prevented from revolving if the engine were towed by another, and this amount of wear, if distributed over the whole surface of the tire instead of being confined to one spot as in the case supposed, would be exactly similar in amount to that which would result if the wheels revolved twice as fast as the engine moved. While this never occurs in practice, it undoubtedly occurs to from ten to twenty per cent. of this amount.

As has been already stated, to prevent the heavy consolidated engines from injuring the track, etc., it is necessary to reduce their speed to 10 or 12 miles per hour. Professor Dudley's experiments have shown that 18 miles per hour is more economical than 10 or 12 miles per hour so far as fuel is concerned; but the question may arise as to the cost of repairs to cars at higher speed. In answer to this, the record of the Cincinnati, New Orleans and Texas Pacific Railroad shows, that the repairs to their fruit-cars—which are ordinary box freight-cars fitted with ventilators—run in a special train at a speed of 25 miles per hour, show no increase over those of the ordinary freight-cars which run at 10 to 15 miles per hour. It, therefore, would appear that the eight-wheel engine having 18 x 24-inch cylinders and 59 to 60-inch driving-wheels, with from 17,000 to 18,000 pounds per wheel, were the most economical engines for freight-service for all ordinary uses; for this type is cheaper at first cost, costs less per mile for fuel, less per mile for repairs, can be run at higher speeds with less injury to the track, curves, etc., and its adhesion and tractive force is equal to that of the mogul of the same size.

In this connection it may be well to cite the report of some experiments made on the Boston and Albany Railroad to determine the comparative advantages of the mogul and eight-wheel types of engines. The mogul was named "Brown," the eight-wheel engines the "Virginia" and "Adirondack." The cylinders of all the engines were of the same size—18 x 26 inches—the dummy wheels were all of the same diameter—4 feet 6 inches—except those of the "Virginia," which were 5 feet. The boilers differed in these particulars: The furnace of the "Brown" was 65¾ inches long, 35 inches wide and 56½ inches high; tubes 162, 2 inches diameter, 11 feet 4 inches long. Those of the "Adirondack" and "Virginia," 54 inches long, 41½ inches wide and 51½ inches high; tubes 162, 2 inches diameter and 11 feet 10 inches long. So it will be seen that as to the area of the grate there were 60 square inches of difference in favor of the "Brown," and 42 square feet in the flues in favor of the "Virginia" and "Adirondack." The weight of the "Brown" is 73,000 pounds, with 55,200 pounds on the drivers; the "Virginia" and "Adirondack," 67,150 pounds, with 43,000 pounds on the drivers. On the first trial between the "Brown" and "Virginia," five round-trips were made between Greenbush and Pittsfield; 105 full loaded line-cars were taken east, and 175 (a large number of which were empty) were taken west by each engine. The fuel consumed by the "Brown" was 30,850 pounds of coal, costing $107.93; by the "Virginia," 23,924 pounds of coal, costing $83.73. On the second trial between the "Brown" and "Adirondack," nine round-trips were made between Springfield and Boston; 224 cars, less 24 from Worcester to Boston, were taken east, and 320, less five from Worcester to Springfield, west by the "Brown;" and 223 east and 307, less three from Worcester to Springfield, west by the "Adirondack." The fuel consumed by the "Brown" was 106,150 pounds, costing $371; by the "Adirondack," 83,090 pounds, costing $290. The average time upon the trial was, going east to Charlton Summit, 1 hour and 4 minutes in favor of the "Adirondack," and from Boston to the same point, 1 hour and 39 minutes in favor of the same engine. On the third trial between the same engines, 14 round-trips were made between Greenbush and Pittsfield; 317 full loaded cars were taken east and 387 west by the "Brown," 317 east and 372 west by the "Adirondack." The fuel consumed was 86,148 pounds by the "Brown," costing $301.54; and 69,676 pounds by the "Adirondack," costing $226.36. Thus it will be seen that in 37 days' trial the mogul burnt 225,148 pounds of coal, costing $790.54; and the eight-wheel engines 176,690 pounds, costing $600.11; showing in favor of the latter a saving of 48,458 pounds of coal, or $190.43. This seems to be very conclusive.

ENGLISH AND AMERICAN RAILWAYS.

BY W. E. PARTRIDGE.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE August number of *Harper's Magazine* contains an article on English and American railways which is ostensibly an analysis of the systems employed in the two countries. The social and economic sides of the subject are fairly discussed, though the author shows rather greater familiarity with the principles and social customs of the English than the American system. The observations are in the main correct and conclusions justly drawn. The illustrations are, as is usual with *Harper's*, very good, if we except the pair which are devoted to American railways. That the sketch of the interior is imaginary, is proved by a curious uniformity in size of all the figures, as well as by certain rather amusing blunders in perspective and mechanical detail.

Although the subject, treated from a popular point of view, permits of little technicality in connection with mechanical matters, that little should be correct. Unfortunately the author is decidedly "off the irons" in this department of his subject.

In the statement that the American car consists of one compartment the entire length of the vehicle, and the English of several compartments of its entire width, the author misses completely the characteristic distinction between the cars used in the two countries, while at the same time he asserts what is not true.

American car-wheels he speaks of as "small, solid looking," and twice calls them "wide-flanged," apparently ignorant of the fact that a vast number of American cars have the same size of wheels as the English, and that flanges are no wider in America than in England.

Because a high speed is attained within 500 yards the tractive force is supposed to be extraordinary. The effect of a lighter train is not, of course, considered. The cab, the bell and the pilot each receive a word, and misinform-

ation is given in regard to each. The latter is called a "cow-destroyer." Had the author ridden much upon American roads at night his remarks upon the powerful head-light used in this country would have been materially altered.

The character of the praise bestowed upon English car-wheels betrays an ignorance of their weaknesses as well as of the best points of car-wheels generally.

The American system of checks is mentioned and some of its advantages enumerated. In pointing out the objection to the introduction of such a system in England, the author evidently supposes the "baggage-express" a part of the check system. The system of checks is quite as applicable to the English as to the American method of traveling. It is applicable alike to the coat-room, the luggage-van, the depot, or the hotel. While the baggage-express may not be suitable for the English traveler, the check system of identifying and receipting for baggage is applicable in any place where baggage is carried in charge of companies' servants or deposited for safe-keeping.

On the question of class the author makes the standard blunder in supposing that first, second and third-class do not exist in America. On nearly all American roads there are at least three distant classes and on some four. A few roads make distinctions which entitle them to five classes. The normal ticket of the country is usually called first-class on its face. It is not so, however, by any means. Below this comes second-class which only entitles the holder to ride in the smoker or some other second-class car. Third-class is often the emigrant class. The so-called first-class ticket differs from the two classes below it in that the passenger may travel first-class if he chooses, and must hold such a ticket in any event if he wishes to go first-class on ordinary trains; with lower class tickets the ticket itself must be changed to secure a first-class passage. The first-class on ordinary trains is the parlor or sleeping-car passenger; he, of course, holding a double ticket. The really first-class, however, is to be found on the limited trains, where, as in the palace-car, the passenger usually holds a double ticket. The classes in America, then, may be enumerated thus: limited, parlor, first (or common), second and third (or emigrant). Four of these are widely recognized; second and third are frequently merged in one, and, of course, there are many lines that do not run "limited" trains. The general practice appears to be so uniform as to bear out the assertion that at least four classes are recognized in America. Bearing these facts in mind it is easy to see how far astray the author goes in asserting that the so-called first-class of America is the English third-class. It more nearly approaches the second, but is essentially different from any class known abroad.

The discussion of speed of trains is very unsatisfactory. There are a few fast trains in this country and many in England. Long journeys and short, however, must not be taken for comparison. Nor is it fair to compare trains between New York and Boston which make many "know-nothing" stops, with express-trains in any part of the world.

An examination into the differences between English and American railway practice is both interesting and instructive. The facts are frequently lost sight of by those who should be perfectly familiar with them.

The radical difference between an English and an American car is that the English car is entered from the sides and the American car from the ends. The internal arrangement has no significance. The English car of to-day is what the cars of both countries were in the beginning—a series of coach-bodies placed on a frame. The American car is no longer a coach-body. Convenience of exit and of internal arrangement have been sacrificed to the necessity of strength and safety. Cars built with continuous sides and frames in the American style go without material injury through accidents which would completely wreck cars framed on the English system. The difference in strength is not due to a difference in weight, but is structural. Baggage-cars, which are far more strongly framed than passenger-coaches, are more easily wrecked on account of their side-doors. The continuous truss along the side of a passenger-coach is invaluable for its resisting power. Thousands of accidents are considered trivial which, with cars having side doors, would be slaughters. Notably the accident some years ago at Wollaston, Mass., which was very fatal. Two English cars in the train went completely to pieces, causing a large part of the loss of life. About the same time an accident occurred to the "Chicago Limited," which was quite as severe mechanically, which did not reach the daily papers. A train at about 50 miles per hour ran out of an open switch, across a freight-yard. The cars were scattered about but no person was hurt except the express messenger, whose car had its end crushed. The passengers were saved by the strength of the cars alone.

Desirable as side doors are, it does not appear probable that accidents will ever become so few in number as to make them safe or prudent. Loss of life in accidents is small so long as the cars are intact. If they break up, a trivial accident will usually cost many lives.

In the character of the car-wheels employed, English and American practice once differed very widely. The 33-inch cast-iron wheel was, at one time, almost universally used in this country for both passenger and freight-service. The advantage of a larger diameter has long been felt, and with the introduction of the paper and other cushioned wheels, the English size of 42 inches has been largely adopted. The passenger usually attributes the smoothness of running, gained by the large wheel, to an improved condition of the track. This mistake is quite natural as the car with large wheels is no higher than the others, and the wheels do not show. Such wheels need larger axles than those commonly used for them.

Formerly one of the distinctive features of the American railway system was the truck. This is perhaps the most difficult piece of mechanism to understand, and this is probably the reason why its use has spread so slowly abroad. Its advantages are bringing it into use on many English engines as well as cars. In the earlier efforts to copy our trucks, the principle of the equalizer was missed entirely, and even now the swing beam frequently lacks those qualities which give it any structural advantage.

Elasticity and flexibility are quite as valuable on perfect road-beds as on the most defective. The destruction of rigid and flexible rolling-stock on a perfect road has but recently received attention. Investigation of the subject is causing the adoption of American ideas abroad, and we may expect before many years to see foreign practice closely assimulating the American in respect to elasticity and flexibility of rolling-stock. The adoption of a style

of car having numerous side-doors, as on many of the Coney Island roads, can only be looked upon as a dangerous step backward, which is liable to make a run off or an upset the occasion of a calamitous loss of life. We may, therefore, conclude that as long as one of the leading ideas of American railway management is safety, the side-doors will be left to the use of nations which make a greater protestation while they have little real care for for the safety of their railway passenger.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

III. THE MISSOURI PACIFIC RAILWAY.

THE medical department of the Missouri Pacific Railway, together with the Texas and Pacific Railway, was established in 1879, and is administered by a chief surgeon at St. Louis, three assistant chief surgeons located at Sedalia, Mo., Atchison, Kans., and Fort Worth, Tex., and 128 local surgeons at the most important points of the system, about 60 miles apart. These last are employed under contract, according to an established fee-bill, and their services are required chiefly in emergencies and in case of such injuries and ailments as do not need removal to hospital. There are already hospitals in operation at St. Louis and Sedalia, Mo., Fort Worth and Marshall, Tex. A fifth is under construction at Palestine, Tex., and a sixth will soon be erected at Atchison, Kans. Each hospital has two house surgeons and a druggist, and Sisters of Mercy are employed as nurses.

The hospital department is distinct from all others in its control and accounts. Its expenses are met by deductions from the monthly pay of all employés, at the rate of 25 cents per month on wages of $100 and less, and 50 cents on wages of more than $100 per month. Sick and injured employés are furnished with certificates of disability by a foreman, approved by the head of the department, except in case of emergency; also passes to the nearest company hospital, where they are entitled to medical attendance, medicines and maintenance. Cases of venereal disease are not admitted.

All expenses incurred for treatment and transportation of injured employés prior to admission are at the charge of the company, and in case of death from injury the company defrays the cost of burial.

Hospital surgeons report monthly to the chief surgeon. Their reports state the number of patients admitted, discharged, dead and remaining under treatment; a classification of inmates according to their branch of service, age and social condition; injury or ailment of those admitted; number of prescriptions for in-patients and out-patients; an account of laundry work done and of meals supplied; an ambulance exhibit of patients transported to hospital; and a roster of hospital employés. Local surgeons are required to make a special report of every case of injury that falls under their hands, covering no less than twelve different points of inquiry, and accompanied, when necessary, by an anatomical diagram to illustrate the nature of the injury.

In 1885 a system of sanitary inspections was instituted, having reference to buildings and grounds belonging to the company. Separate blanks are provided for reports upon the sanitary condition of station-houses, section-houses, shops, etc., with grounds attached, covering eighteen points of inquiry. Moreover, quantities of disinfectants and deodorants have been supplied, with instructions for their use. Five hundred and eighty of these reports have already been rendered, and nearly $1,200 have been expended for disinfectants and sanitary work.

Very encouraging results have been obtained from the first season's trial of this new feature. Besides, the water at various stations has been subjected to chemical analysis, and it is contemplated to issue a tract of instructions to employés for selecting and using drinking water. In the event of the appearance of cholera, printed instructions will be distributed for guarding against this disease. It is designed shortly to issue a report on endemic diseases, to instruct employés how to protect themselves against local insanitary conditions. This systematic work for the prevention of disease is an important advance in the right direction and is sure to bear more beneficial fruits, in proportion to cost, than any other branch of the medical service, for its extra cost must be trivial, and the data furnished will show precisely what sanitary improvements are needed.

No provision is made for extending medical relief to the families of employés. This is a very desirable feature, for a large proportion of the men are married, and their families might be included in its benefits without any great increase in the expense of the service. Such cases would be exclusively medical and would be treated at home or at the doctor's office. Medicines would be at the expense of the family if no fund were available. A free pass over the road for a limited distance in either direction would go far, perhaps completely, to compensate the local surgeon for the extra service, and the company would not feel this burden. A small additional assessment on the wages of family men would supply any deficiency.

No physical examination of employés is made to test their general soundness of health or the integrity of their organs of sight and hearing. This measure should be adopted, not merely for the safety of trains but also for a guarantee to the hospital fund against undue burdens. The hospital department of the company is a mutual benefit association, the fundamental principle of which is equalization of contributions, risks and benefits, according to the lights of experience. Physical unsoundness disturbs the just equilibrium and is sure to make the institution a pauper asylum for a number of individuals who might be sifted out by a preliminary medical examination.

Cattle-cars are disinfected after use, but owners and shippers of live animals are presumed to be properly governed by their own pecuniary interests so as to avoid subjecting them to undue hardship in transportation. Experience shows this to be a supposition not justified by experience. Undoubtedly control and supervision are demanded, not only as a guarantee to future consumers but as an adequate safeguard against loss to the present owner. It is simply a question whether the control should

be provided by the state or by the company. Suitable rules might be framed by the medical department and carried out effectually by the operating department without invoking legislation, but it is clear that the latter will sooner or later be demanded by the public, in case of continued neglect by railway companies.

The foregoing criticisms apply to most of the railway companies in this country, and consequently have no peculiar application to the one now in question. These provisions are strictly carried out upon the railway lines of France and most other countries of continental Europe, and must eventually be adopted by the leading companies of this country.

In closing this article, I would acknowledge my indebtedness to Dr. W. B. Outten, of St. Louis, chief surgeon of the company, who has kindly supplied the necessary data.

PIECE WORK IN THE RAILWAY PAINT-SHOP.

BY F. S. BALL.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

HAS piece work any advantage over day work? We hold that it has. Day work is a contract to pay a specified sum or compensation for a certain number of hours per day of labor, or a moiety thereof per hour. The amount of labor to be done does not usually enter into the contract, and is as variable as the will and ability of different workmen and the varied qualifications and executive abilities of the master painters can make it. Piece work is a contract to do a stated amount of work, as per certain specifications, for a stipulated sum of money, and is invariable for all jobs of like character or class, which is not the case when labor is paid by the hour. Wherever it has been adopted, an increase of one-third more work and a reduction of cost in like ratio, without any increase of working force, together with an increase of earning power to the employé, has been the result. The following are some of the advantages to the employer, in addition to those referred to above: Protection from loss by reason of damage caused by carelessness or want of skill on the part of the workmen, the damage having to be made good at his own expense, all operations being inspected by the foreman in charge, when reported finished, and credit allowed only when satisfactorily performed, the foreman being the judge. It enables the foreman to determine the qualifications of each new employé more readily than under the day system, as under that system the slow and unskillful man is usually screened and assisted by those with whom he works, while under the piece work system each man in relation to the employer is an individual contractor and in limited partnership with relation to his fellow-workmen, and is not disposed to divide his earnings with any who are not as skillful and fully as able to earn their share of the proceeds of their joint labor. Hence he will object to the retention of any such as may be unwittingly employed, because, also, he becomes as a partner responsible for and must assist in repairing any damage occasioned by such unskillful or careless workman. It secures to the company the services of good workmen. Where shops are located at isolated points, at a distance from business centers, and employment at those shops are the only means of support available to the men except at the expense of moving away, much difficulty is usually experienced, at a time of a sudden influx of work, to obtain any increase of the working force, unless exceptionally high wages are offered; the reason being that men are not inclined to accept a job at such points on account of probable fluctuations in the work to be done, and the trouble and expense entailed, in case they should lose their job in a short time, in seeking work elsewhere, But piece work, in allowing increased earning power to a definite number of hands for a length of time in each year, which can be averaged, say nine months, compensates for the enforced idleness of the other three, and much of this may be made up on odd jobs outside of the company's employ, besides insuring steady employment to that number, and obviating the necessity of any reduction of the working force, except at times of the most extraordinary business depression; and any increase of business or work, can be met by an increase of the hours of labor, or overtime, without increasing the number of hands; hence the men finding that their average wages the year round are as much as they can earn elsewhere, are not disposed to change for every trifling or temporary advantage offered them. It relieves the foreman of the immediate oversight of the men and transfers it to the results of their labors alone, enabling him to devote more time to the perfecting of methods and details of shop management, and to the investigation of such questions relative to car and locomotive-painting as are continually arising. It in a measure divides the responsibility, or, rather, furnishes him a means of self-protection against carelessness on the part of the workman, without resultant loss to the company, or the no less disagreeable alternative of disciplining by suspension or discharge. It is self-adjusting as to the relations of the employé with the company and one another, on a strictly business basis, because the skillful and industrious will naturally desire to work with those who are equally so; and where skill is not required, industry is the standard, and all who are unable or unwilling to meet the requirements must give place to those who can, for the reasons before stated. The advantages to the workmen are also important. The intelligent and skilled workman is enabled to reap the rewards of his superior acquirements, the industrious the reward of industry, each earning according to his ability and disposition; he is freed from servile dependence on the judgement and responsibility of his superiors and is made to assume some of the responsibility himself, and has to depend upon his own judgment to a greater extent, which makes him self-reliant. His inventive faculties are called into exercise to devise new and easier as well as quicker means to attain desired ends, and he educates himself and fellows in business methods, and has every opportunity and encouragement to develop any latent faculties he may possess. He learns to set a value on every minute of his time and is not disposed to waste it, because it is a part of his capital; and a very short experience in working by this system enables him to determine the exact money value of any job he may be given. Where it is desired to make trial of the system, the simplest method is for the master painter to base his prices for piece work on the knowledge his experience has given him of the value of each operation under the old plan, represented by so many hours' labor, and deduct

30 per cent. from the cost; the remainder will be a fair price to pay for the operation under the piece-work system. He should first, however, make an alphabetical classification of all cars that come to his shop for repairs, to enable him to again classify the work to be done on them; all cars of one form of construction Class A, of another form Class B, etc., then the needed repairs to these as Class 1 repairs, Class 2 repairs and Class 3 repairs, and more if desired; but the three classes will usually cover all ordinary requirements. This classification of work should be written or printed in form, and posted in the shop for the information of the workmen, and may be in form as follows:

CLASS 1 REPAIRS—OUTSIDE.

Burn off old paint.

(Here describe whatever method is pursued in repainting, from priming to finishing).

Paint roof and black iron-work. Paint, stripe, and varnish trucks.

CLASS 1 REPAIRS—INSIDE.

Fill hard wood and varnish, or whatever other method is pursued, according to inside finish of car.

Repaint head-lining, or replace with a new one.

Repaint sash, varnish blinds and seats, stating number of coats, etc.

Paint floor and platforms.

CLASS 2 REPAIRS—IF HARD WOOD FINISH.

Prime new work and bare spots, and when dry putty up and face down with pumice stone or sandpaper, as may be the practice; then repaint, stripe and varnish on surface thus obtained; paint trucks, roofs, etc.

Clean down and sandpaper, touch up and putty where needed, and give one coat of varnish; rub down and oil off. If inside is painted, give number of coats necessary to this class of repairs.

Clean and touch up head-linings, etc.

CLASS 3 REPAIRS—OUTSIDE.

Scrub down with (here describe what is used). Touch up (under this head a detailed statement may be made, and the amount of such touching up averaged), and varnish (say how many coats), one coat of paint on trucks, and restripe and varnish; paint roof and black irons.

CLASS 3 REPAIRS—INSIDE.

Scrub thoroughly (describe here whatever is the practice or method). Touch up scarred places, and tops of seat-arms and window-sills, and paint floor and platforms. Clean glass, etc.

This classification may be varied according to the requirements of differently constructed cars and the prevailing practice of each shop. Then the working force may be divided into three gangs—No. 1 stripers and varnishers, No. 2 inside varnishers, or hard wood finishers, No. 3 brush hands—one in each gang being appointed gang leader, or foreman, whose business it is to consult with the master painter in reference to all work, to distribute the work among the men to the best advantage, see that they are supplied with materials and tools as soon as wanted, keep the accounts for the gang, and doing his share of the work when not otherwise employed, the master painter assigning to the several gang foremen the cars as they are received into the shop, as their share of work. The account may be kept in the following manner: The master painter keeps a record of cars as they come into the shop, and to whom assigned, with the class of repairs needed or determined upon. The gang foreman also keeps a record of when the car was assigned him, with class of repairs ordered, and from day to day, as an operation is completed on the car or cars, he enters the charge on his book, with date that the operation was completed, thus—

Sept. 1. To coat of priming, No. 123, Class A, passenger-car..........$1.40
Sept. 3. To second coat, No. 123, Class A, passenger-car.. .. .. 1.40
Sept. 4. To puttying, No. 123, Class A, passenger-car............ .... 4.00
Sept. 6. To third coat, No. 123, Class A, passenger-car................ 1.20

and so on throughout until the car is completed. Each operation, after being finished, is reported as finished to the master painter, who inspects it at his convenience and before the next operation is begun, when, if it is satisfactory, he accepts it, and gives credit in his account-book for the amount due to that gang; if not, it must be made satisfactory before credit is allowed. On the day before the last day of the month, the gang foreman closes the accounts of his gang and hands his book in to the master painter, who compares it with the accounts kept by himself, and if found correct it is so marked and returned, and the master painter returns his to the office of shop clerk. In addition to keeping the accounts the gang foreman also keeps a time book, or record of the time made by each man, and at the end of each month the total sum of earnings is divided by the total number of hours' labor, which will give the amount per hour of earnings which each man is entitled to receive for the number of hours he has worked.

That there are no objectionable features to the system is not to be expected, and therefore we will close this paper with what appear to be the most serious, as we have experienced them. It fosters, if it does not create, intense selfishness and greed in the employé; the weak are crowded out, and the strong overwork and break themselves down in a short time, exemplifying in a manner the Darwinian theory of the survival of the fittest. It is a serious obstacle to apprenticeship, and a hindrance to teaching boys a trade, for, as we have shown, there is no place for the unskillful or the weak in piece work, nor have men working in this way any time to devote to the instruction of learners.

SUCCESSFUL RAILWAY MANAGEMENT.

A WRITER in the *National Car-Builder* devotes two columns to urging the necessity of more mechanical training among the higher officials of railways. He ascribes the inability of many roads to make a profit to this lack of mechanical knowledge on the part of managers; and gives some instances of leaks which might have been stopped or prevented.

It is possibly desirable that every man should possess full knowledge of every subject, and ability to do every thing. But, fortunately or unfortunately, we are not so constituted. Time was when the field of human knowledge and experience was very limited, and it was possible for one mind to compass it all. But "the thoughts of men have widened with the process of the suns." The

horizon of knowledge, which at first seemed so near and receded so slowly, now seems illimitable and infinite. It has come to be acknowledged in these later days that important results can only be obtained by confining one's field to some specialty and working for that alone. A certain degree of versatility is admissible—but one's life work to be effective must lie in some certain channel. "No man can serve two masters." If he would be a good lawyer he could not be a good doctor. A poet is never a good mechanic. Each has his particular adaptation. The one may appreciate, enjoy and use the works of the other. He may even direct the thought and purpose of the other—though he could not think the same thoughts nor do the same work himself. It is a wise provision of providence which gives men different predilections and tendencies. The different departments of life fit into each other. A man may know something on almost every topic, but unless he has some specific work to which he devotes himself and in which he excels he will be a failure. A river may spread out very widely and yet be navigable if it has a channel—but if its whole breadth be shallow, it is useless. The same is true of a man; if he has a deep channel for his natural and acquired abilities he may let his mind run over into adjoining fields of knowledge and yet feel secure.

Now there is no such profession or trade as "railroading." The operation and management of railroads requires a number of distinct and in some respects essentially different classes of men. This fact becomes more and more apparent daily. We do not believe there is a man in existence who "knows all about a railroad" and is fully fitted by natural ability and acquired information to fill creditably any position from brakeman to president. He may be a good "passenger man" or a good "freight man" or a "shrewd purchaser" or an "excellent mechanic"—but he cannot be all. This fact is recognized in all companies which are large enough to require the services of a sufficient number of officials for organizing into departments. Thus we find that the larger railway companies have an executive, a legal, a treasury and accounting, a traffic and operating department. These again are subdivided—the traffic, into freight and passenger; and the operating into transportation, road and mechanical departments. It is true that men are frequently transferred from one department to another, but that is because of the development of the fact that his abilities fit him better for the new position. But the master mechanic does not often become chief engineer or solicitor; nor does the treasurer or auditor become car-builder or bridge supervisor.

Mangerial ability is something distinct from and in a sense superior to all others. It does not require specific personal knowledge of mechanics, or law, or trade; but it requires the ability to select men who do. The surest index to the ability and character of the President of the United States is his cabinet. He may know very little about finance, but may have the discrimination to select and appoint as secretary of the treasury, a man who of all others is best fitted for that position. And he is a far better president who is able to select the most competent cabinet officers and vest them with due authority in their own departments, than he who is conceited enough to belive that all knowledge is concentrated within himself, and selects only tools to do his bidding. It is beyond the power of any railway manager to extend his supervision to all the details of the service. He must entrust them to others. He is the best railway manager who secures the most perfect organization and the best men in charge of all departments of it. He must have many of the attributes of the successful general. He must be a good judge of character—an ability which he may exercise in diplomacy as well as in the selection of subordinates.

The writer named mentions several instances of lack of knowledge on the part of managers and superintendents. He implies that they should be thoroughly posted on such topics as car-painting and iron manufacturing; and should be expert accountants. It is no part of a manager's duty to be posted on paints and oils; but it is his duty to secure a man in charge of the proper department who is so posted. It may be asked how he can do this if he is not himself thoroughly acquainted with the subject. That is just where the managerial talent comes in; it is in the nature of business tact—not an intuition, but the combined product of intuition and observation. Such a manager does not need to spend time on trifling details; he holds his subordinates responsible for them. If he wishes to investigate any subject with a view to reform, he calls upon the proper subordinate official to report to him upon that subject. If the subordinate can not make a reliable report, he will get one who can. He requires every head of department to be "up with the times" and to devote his best endeavors to the company's service. He will not tolerate mere machine men; and so far from discouraging suggestions, will require them.

But we did not undertake to give a recipe for an efficient general manager. The point which we make is that the managerial ability, upon which the success of any well-located road principally depends, is something entirely different from and independent of mechanical knowledge. What is needed is not a higher mechanical training on the part of chief railway officials—but that each man should excel in his special department; and should be held responsible to the general management. The tendency of the day is toward this system, and it is the correct tendency. It does not alter the case to say that there are many incompetent railway managers and superintendents. That is true, but the same thing runs all through the service. No amount of mechanical perfection will of itself make a road prosperous. Money may be saved in one way only to be lost in another. Perfection is to be sought in all departments; and it is the business of the general management to harmonize all and see that all alike are properly cultivated.—*Railway Review.*

Railway Accidents in Great Britain in 1884.

THE following is the record of railway accidents in Great Britian during the year 1884, compiled by the London *Railway News:*

Of railway servants 29 were killed and 341 injured while employed in coupling or uncoupling of trains, 42 were killed and 554 injured in getting on or off engines, 41 killed and 119 injured by being caught between vehicles, 26 killed and 107 injured by falling between the train and platform, 113 killed and 153 injured while working on the permanent way and sidings, 149 killed and 238 injured while

walking, crossing, or standing on the line in the course of their duty. In the table following will be found the number of servants of railway companies killed and injured by train accidents and while engaged in their several occupations in the respective years 1874 to 1884, and the proportion of the whole number killed and of the whole number injured to the total number employed, being calculated upon the numbers given in the returns presented to parliament in the years 1874 and 1884. The numbers employed are known accurately only for the years 1874 and 1884. They have been calculated for the intermediate years on the assumption that the numbers have increased in regular proportion year by year:

	By train accidents.		Other accidents on railways.		Proportion of accidents to number employed.	
Year	Killed.	Injured.	Killed.	Injured,	Killed.	Injured.
1874	46	271	742	2,554	1 in 327	1 in 89
1875	21	239	744	3,379	1 in 334	1 in 70
1876	28	236	645	2,364	1 in 385	1 in 96
1877	22	154	620	2,009	1 in 414	1 in 123
1878	15	156	529	1,847	1 in 500	1 in 135
1879	8	118	444	1,836	1 in 619	1 in 143
1880	23	118	523	1,962	1 in 531	1 in 139
1881	19	168	502	2,278	1 in 576	1 in 123
1882	21	153	532	2,423	1 in 570	1 in 122
1883	11	87	543	2,373	1 in 596	1 in 134
1884	23	215	523	2,204	1 in 634	1 in 149

The table shows that there has been an almost steady decrease during this period in the proportion of servants killed and injured to the number employed. The following table shows the number of men employed by the companies in various occupations and the number of fatal accidents and injuries to each class in 1884, and thus affords an idea of the relative amount of risk run by the various classes of railway servants:

Class of servants.	Number employed.	Kld.	Inj.	Proportion to number employed. Killed.	Injured.
Brakers, and good-gds	7,047	53	447	1 in 139	1 in 17
Gatekeepers	1,605	10	8	1 in 160	1 in 200
Permanent-way men	37,840	125	154	1 in 303	1 in 245
Firemen	12,795	31	152	1 in 422	1 in 84
Engine-drivers	12,874	27	138	1 in 476	1 in 92
Porters and shunters	48,070	97	732	1 in 494	1 in 65
Inspector	3,518	7	34	1 in 502	1 in 103
Guards, passenger	5,902	6	68	1 in 983	1 in 87
Ticket collectors, etc.	2,060	2	8	1 in 1,030	1 in 257
Points and signalmen	19,012	18	49	1 in 1,056	1 in 390
Laborers	70,405	41	84	1 in 1,717	1 in 840
Station-masters	6,165	3	6	1 in 2,055	1 in 1,027
Mechanics	55,940	20	39	1 in 2,797	1 in 1,434
Other classes	62,833	106	400	1 in 592	1 in 157
*Total	346,426	546	2,319	1 in 634	1 in 149

*Employed in the traffic, locomotive, etc., and engineers' and storekeepers' departments.

The number of causes which contributed to the investigated accidents of the past year have, in some instances, slightly decreased in comparison with those of the previous year, although the number of accidents inquired into has increased by nearly 12 per cent. There is an increase over the previous year in the number of accidents due to defective maintainance and construction of roads, but a considerable decrease in accidents due to defective construction of rolling-stock, to insufficient or defective accommodation, to defective signal arrangements, from the want of block working, the mistakes of officers and servants, and to excessive speed. There is no improvement, however, under the head of accidents due to inadequate or unsuitable brake power.

The principal causes which led to the accidents appear to have been: (1) Negligence, want of care, mistakes; (2) inadequate or unsuitable brake power; (3) excessive speed; (4) defective maintenance and construction of roads or works; (5) defective system of securing intervals between trains.

The Steel-Rail Trade.

THE few last weeks have, according to the *Iron Age*, taught a lesson to many iron manufacturers who were induced by the boom talk earlier in the season to hold out for higher prices. Many of them are now endeavoring to fill order-books because the bids they declined went to more conservative competitors, and the result is that prices are practically where they were. The entire trade applauded the steel-rail makers when they put aside trade rivalries and personal animosities, and, early in August, adopted the policy which has borne such excellent fruit. Rails were then selling in large lots at $26 at eastern mills, and there is reason to believe that even that figure was shaded in more than one instance. Now they have been getting generally $30 at mill for next year's delivery. That is certainly a substantial advance, although it must not be forgotten that part-time work, under the allotment plan, means a slight increase in the cost of manufacture. There has been for some time a feeling among some of the mills that the situation warrants a further notable advance, and claims have been repeatedly put forward that $1 or even $2 more at mill have been secured for round lots, 1886 delivery. The accuracy of these statements is questioned on the ground that lower bids have repeatedly caused the loss of orders within the last week. The situation as it is to-day may be summed up as follows: An estimate of the orders for 1886 delivery which it is known have been placed, and their distribution among the different actively competing mills, give color to the assertion that between 375,000 and 400,000 tons have been ordered thus far by the railways. That would be equivalent to about one-half of the allotment, though it should be noted that, so far as is known, four mills having an allotment together of roughly 140,00 tons, have as yet an empty order-book. They could, according to agreement, if they chose, transfer any part or the whole allotment to any other mill for any consideration the parties to the transfer might see fit to settle upon. We mention this point as showing that thus far the leading mills have taken more than one-half of their allotment, and that circumstances might lead to their adding to their work beyond it.

The question which now comes up as the outgrowth of the fact that one-half of the allotment is already placed, is whether it would be wiser for the rail mills to increase the allotment, which is unquestionably below the actual requirements of the country, or whether it would be more judicious to create higher values by allowing the real or assumed indifference of sellers to operate. It may be stated at the outset, to relieve the rail mills of the odium attending too rigorous combinations, that they are still competing very rigorously, in spite of the fact that a good deal of unnecessary bidding is avoided very often by previous understanding among sellers. Leading representatives of the steel trade express the conviction that the demand for 1886 work will ultimately certainly foot up to 1,000,000 gross tons, and that at least 200,000 tons in addition will be alloted to the different works. They hold it to be a very unwise policy to attempt to drive up the price, because it is likely to cause a reaction among buyers who are already beginning to show a spirit of antagonism. A good deal of work is still being withheld by the railways, who are quietly awaiting developments. "Booming" the market will not frighten them. It will, on the contrary,

offer additional inducements to them to take the risk of waiting. The rail mills have shown an excellent spirit during the history of the combination thus far. Some of the works have voluntarily given to others who held that they had not been fairly treated in the allotment a part of their tonnage, but any abuse of their power would be dangerous. Economy is so closely watched nowadays among railway boards of directors that, while orders for rails at $30 would be promptly sanctioned, they might be vetoed if sellers demanded $35.

Discussions at the Master Mechanics' Convention.

THE following are the subjects to be discussed at the next meeting of the American Railway Master Mechanics' Association, to be held in Boston, in June, 1886, and the committees to report thereon:

Improvement in Boiler Construction: Geo. W. Stevens, Wm. Fuller, T. J. Hatswell.

Standard Driving-Wheel Centers and Standard Section of Tire: J. N. Lauder, Jacob Johann, H. N. Sprague.

Driving-Wheel Brakes: To what extent is their use advisable, and Best Method of Application: J. Davis Barnett, H. A. Whitney, F. M. Wilder.

Balance Slide-Valves: Charles Blackwell, James Meehan, E. M. Roberts.

Best Material and Form of Construction for Locomotive Guides and Cross-Heads: A. J. Cromwell, William Swanston, A. Beckert.

Best Plan for Removing, Cleaning and Resetting Flues: Clem. Hackney, A. W. Sullivan, G. H. Prescott.

Shop Tools and Machinery: D. A. Wightman, A. J. Pitkin, F. B. Miles.

Hammer-Blow Tests of Locomotives: William Woodcock, Thos. L. Chapman, Coleman Sellers, Angus Sinclair, F. W. Dean.

Papers to be read by two Associate Members, viz.: Robert Grimshaw and John A. Coleman.

Railway Taxation in New Jersey.

THE state board of assessors of New Jersey have filed with the comptroller their second annual return under the new Railroad Tax law. Ninety-six railways and canals are assessed, almost all of which are included in four systems—the Pennsylvania, the Philadelphia and Reading, the Delaware, Lackawanna and Western, and the New York, Lake Erie and Western. The total valuations of all the roads are as follows:

For road-bed, etc., of main stem, $81,108,600; for real estate, excepting road-bed, $37,970,412; for personal property, equipments, etc., $21,702,080; for franchise, $52,183,293. Total, $192,964,385.

Last year the total was $190,437,993. This years valuation and tax is divided as follows:

Pennsylvania system—Valuation, $61,904,991; state tax, $309,525; local tax for cities and towns, $97,332; total tax, $406,857.

Reading system—Valuation, $46,738,642; state tax, $233,693; local tax, $84,386; total tax, $318,079.

Erie system—Valuation, $12,324,589; state tax, $61,622; local tax, $43,185; total tax, $104,807.

Lackawanna system—Valuation, $37,209,902; state tax, $186,049; local tax, $68,950; total tax, $254,999.

Independent roads—Valuation, $34,786,261; state tax, $173,931; local tax, $83,632; total tax, $257,563.

Compared with last year, the returns show in the Pennsylvania system increases of $4,455,766 in valuation, $22,279 in state tax and $5,978 in local tax. In the Reading system there are decreases of $5,034,007 in valuation, $25,169 in state tax and $103 increase in local tax. In the Erie system there are decreases of $692,043 in valuation, $3,460 in state tax and $1,221 in local tax. In the Lackawanna system there are increases of $2,483,346 in valuation, $12,416 in state tax and $2,024 in local tax. In the independent roads there are increases of $1,313,329 in valuation, $6,566 in state tax and $49,118 in local tax. The total net increases in state tax are $12,632, and in local tax, $56,004.

Of the independent roads, the principal ones are the Lehigh Valley and its Easton and Amboy road, which will pay $45,625 state tax and $10,402 local tax on a valuation of $9,125,133, and the New York, West Shore and Buffalo, which will pay on a valuation of $7,906,754 a state tax of $39,533 and a local tax of $46,533. Thirty-four of the ninety-six railways in the state are still contesting the taxes assessed last year under this law.

French Railway Benefit Associations.

IN France the six great railway companies which control the main lines have plans for assuring help to their employés in its service; and when they are too old to work, all combine charity with self-help, in one case by a compulsory retention of a percentage of wages, in another by an assessment, which the men are free to pay or not; but always based on a proportion from the corporation, calculated either on its earnings or its business. Over one hundred and twenty-eight thousand men belong to these mutual aid societies, from the chief engineers down to the humblest employé on the road. Only one of the companies publishes a detailed statement of the amounts paid out by it from the funds of its society. Of a hundred and fifty pensions in 1883 one hundred and thirty-six went to workmen—four receiving a hundred dollars apiece annually, eight a hundred and twenty-five, four a hundred and fifty, and the others two hundred dollars or more. Besides these sums, paid after the expiration of a whole lifetime spent in the service of the company, there were large numbers receiving smaller amounts in compensation for accidents, and there were considerable sums spent on widows and orphans, medical attendance and other such kindly offices. Two of the companies guarantee a minimum pension of a hundred dollars for bachelors, and a hundred and twenty dollars for married men.

Nearly all the great corporations in France have a similar system in force for their men—water works, gas works, insurance companies, banks, both public and private, all make provision for the health and comfort of the employés and for their old age. In England, in Belgium, in Germany, and in all the great centers of industry and capital abroad, there is this wise combination of charity on the part of the owners with preparation for the future on the part of the employed. Neither benevolence on the one hand nor economy on the other can do as much for the workman as a judicious admixture of contributions form

the capitalist who profits by the experience of those who give their lives to his interests, and from the wages of the man who, by beginning while he is still young to save systematically, is encouraged in his labor and in a life of prudence and sobriety by knowing that the return and the reward are sure to come.

The South American Transcontinental Line.

THE first section of the South American transcontinental road extends from Rosario, on the river Parana, westward to Ville Maria, and is 120 miles long. Another section of 82 miles was built by the Argentine government in 1873, and in 1875 the line was extended 76 miles to Ville Mercedes. In 1880 the government completed 59 miles more, taking the road to the city of San Luis. Two years later rails were laid to La Par, 76 miles, and in April last, the completion of the line to Mendoza, 80 miles further, was celebrated by a grand festival. From that point a branch 100 miles long has been constructed northward to the city of San Juan. On the other side of the Andes the Chilians are using a railway 100 miles long, extending from Valparaiso to Los Andes. The gap between the Pacific and Atlantic sections of this trans-Andean road is only 140 miles in length. The route has been surveyed through the Uspallata pass, and it is believed that the missing link will be supplied within two years.

An Early Locomotive.

MR. W. A. CRAFTS, clerk of the Massachusetts Railroad Commission, says in the *Congregationalist*: "The writer remembers seeing, when a boy, a trial trip on the Boston and Worcester Railroad of its first locomotive, built by Robert Stephenson in Newcastle, Eng. It was Fast-Day morning, and, seen from a distance as it went over the back bay, leaving a long trail of smoke and steam behind, it seemed to our inexperienced eyes almost to fly. Fast-Day fifty years ago was not the secular holiday which it has since become, and the limited population of Boston furnished a small number of idlers and pleasure seekers, compared with those of the present day. But in the afternoon large numbers of people, including staid attendants at the morning church service, went to take a look at the new wonder, and were astonished to see it haul, with apparent ease and remarkable speed, ten or twelve loaded dump-cars. This locomotive was mounted on four wheels and weighed about eight tons. By the side of the powerful engines of the present day, weighing forty, fifty, or sixty tons, it would appear as a mere toy. But locomotive construction was then in its infancy, and even six years later the directors of the Boston and Worcester road had grave doubts as to the expediency of adopting engines weighing eleven or twelve tons."

The Master Car-Builders' Car-Coupling Tests.

THE Master Car-Builders' Association have issued the following circular in relation to the recent car-coupling tests at Buffalo:

The executive committee of the Master Car-Builders' Association held a public trial of automotic car-couplers at Buffalo last September, and they selected twelve of the number submitted to be put in service, to the extent of ten cars each, during the coming winter. A sub-committee was then appointed to arrange the details of these trials in service, and this committee is now perfecting arrangements to have ten line-cars, which pass over trunk lines. equipped with each of the twelve couplers selected, and they hope to have them all in service by December 1st.

Each car equipped with these trial couplers will have the following stenciled plainly on each side of the car near one end:

" M. C. B. test ....coupler"

(the name of the coupler on each car being used in the space here left blank), and when the couplers are all in service an additional list will be issued, giving specifically the numbering and lettering on each car equipped with each coupler. In the meantime the stenceling placed upon the cars will serve to identify them. It is desired that these couplers be kept up and remain in active service until May 1st, 1886, and a full and detailed report of the cost of all repairs, as well as of the working, or the failure to work safely, of these couplers will be looked for from all members of the association who are connected with any railroads over which any of these couplers may pass up to that date.

Members of the association are earnestly requested to see that all car-inspectors and foremen of repair shops, as well as trainmen, on the lines with which they are connected, have proper instructions in this matter, and that reports should be made at such a date as will enable members to forward their reports to the secretary in New York not later that May 10th, 1886.

By placing the couplers for trial on line-cars, it is thought that reports may be had from the same source on a number of different couplers, and in order to make the style of such report more uniform and easy for tabulation, we give the points which it is especially desired to have information upon while the cars are on your line.

1. The nature and cost of repairs to couplers on each car receiving such repairs, by car number and name of coupler.
2. State whether there has been any failure of any coupler to couple automatically with its own kind, specifying what couplers have so failed and in how many instances and the cause.
3. State whether any of the couplers have automatically uncoupled when in service on your line, specifying what couplers have so behaved, with the number of such occurrences for each coupler, and with cause and circumstances.
4. Give opinion of your trainmen as to the comparative safety in coupling and uncoupling each style of couplers which have passed over your line when coupled with one of its own kind.
5. Give opinion of your trainmen as to the comparative safety or danger involved in coupling each of the couplers which have passed over your line with the ordinary draw-head, as compared to coupling two ordinary draw-heads together.
6. Give any further information of importance on points not included in the foregoing, which may have been noticed with regard to any of the couplers which have passed over your line.

By order of the executive committee,

M. N. FORNEY, Secretary.

November 20th, 1885.

The Keeley Motor Humbug.

A PHILADELPHIA capitalist states, according to a Washington letter, that if the true life of Keeley, the motor man, could be written it would prove to be one of the most romantic stories of imposture ever known. He says that several years ago, when Keeley's great claims began to be talked about in Philadelphia, he made an investigation for his own sattsfaction into Keeley's past. He thought that he could judge better by his record as a man than by trying to talk with Keeley about his mysterious motor. He found that, just before coming to Philadelphia, he was a performer in a circus, and that he had, nearly all of his life, made a precarious living by performing sleight-of-hand tricks. He is a man of no education, and is absolutely destitute of any scientific acquirement. He says that Keeley has gone to work, however, very skillfully, and has learned the jargon of an extensive scientific vocabulary. He has about eight hundred of these words and phrases at his tongue's end, and he can turn the head of the average scientist by the rapidity and certainty with which he tosses these words and phrases into his general conversation. Keeley has one gift, he says, which is great enough to be called genius, and that is his skill in humbugging people. He has great power,

by mere talk, of setting aside all doubt as to his ability and to influence people to let him have money in the most recklessly confident way. Nearly all of his present backers are New York men. Every now and then these backers become despondent and get together and go over to Philadelphia. Then Mr. Keeley gets up a sleight-of-hand performance for them, talks to them in his peculiarly gifted way, and the trusting capitalists go back buoyed up with hope, fully confident that they are backing one of the great inventors of the age. Keeley has never invented anything, this gentleman says, except stories, and will never give any other dividend upon the capital invested in him beyond that of romance and diversions in the shape of occasional sleight-of-hand performances.

How to Tell the Speed of a Train.

A RULE was recently contributed to *Engineering* by a professor in the Polytechnic School at Prague, for readily determining the speed of a train by counting the revolutions of the drivers, which has a certain convenience, and is as follows:

Count the revolutions for a number of seconds equal to 2-11 of the diameter of the drivers in inches. The number of revolutions counted will be the speed in miles per hour.

For example, if the drivers be 55 inches in diameter, 2-11 of 55 is 10; and if 24 (or any other) number of revolutions are counted in that number of seconds, the speed is that number of miles per hour.

The Coventry Engine.

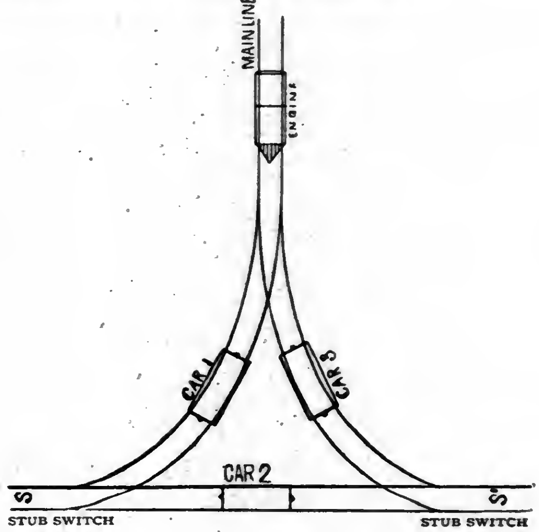
A NEW locomotive is undergoing trial on the Pennsylvania Railroad. It is known as the Coventry engine, named after the inventor, a Chicago man. Outwardly, except that the smoke-stack is close to the cab, there is nothing to distinguish it from a common locomotive. The novelty is in the boiler, which has a return flue, thus doubling the length of the tube, and considerably more than doubling the time of the retention of the heated gases within the boiler.

As the heat in the return flue has been frequently tested at between 1,100 and 1,200 degrees, the inventor claims that it is better to utilize it than to let it escape like a rifle-shot from a straight tube. He claims also that the length of the tube insures the consumption of much gas and smoke that must otherwise escape, and that cinders are precipitated by gravity, so that not only is provision made by the invention for the maximum of steam but for the minimum of dirt. It is a bituminous coal engine.

Mr. Coventry says that the engine can be run at a saving of at least 15 per cent. under other engines of its kind, and is cleaner than any other bituminous coal engine can possibly be. He hopes to have the boiler adopted in new engines that the road may build, both for freight and passenger-service. Bituminous coal is used on the Pennsylvania main line. The railway officials say that there is no likelihood of a change in this respect, although they admit that the engine is cleaner than others that use bituminous coal. The claim of economy will be fully tested.

A Problem in Drilling Cars on a "Y" Switch.

THE following problem in drilling cars on a "Y" switch was recently presented in actual practice on the Erie road. The problem was solved at the time, but solutions from the readers of the JOURNAL are solicited.



Each stub-switch, S and S′, will hold but one car or engine; each arm or end of the "Y" will hold the full train.

Problem: To turn the engine on the "Y" and restore each of the three cars to its original position.

PRESIDENT GARRETT, of the Baltimore and Ohio, has resigned from the directory of the New Jersey Central, on the ground that having completed his arrangements for the terminal on Staten Island, it would be inconsistent for him to maintain his official connection with the latter road. Mr. Garrett was entertained at an elaborate banquet on Staten Island, given in his honor by Mr. Erastus Wiman, on the 16th of this month.

A WELL of good lubricating oil, it is reported, has been struck near the Oregon Short Line, at a depth of 120 feet. A two-inch hole was first drilled, and it is being enlarged to six inches, and many other wells are being drilled in the districts. There is said to be a rich oil belt there, which, at no distant date, is destined to become an important industry.

THE exports of steel rails from Belgium in the first seven months of this year were 27,315 tons, as compared with 31,476 tons in the corresponding period of 1884. Iron rails were exported from Belgium in the first seven months of this year to the extent of 4,552 tons, as compared with 12,552 tons in the corresponding period of 1883.

THE Passaic (N. J.) and New York Railroad, as the new spur of the New York, Susquehanna and Western Railroad is called, will begin running passenger-trains about January 1st. The trains of the branch connect with the main line a short distance above Hackensack.

THE balloting for a standard brake-shoe and head conducted by the Master Car-Builders' Association, has not yet resulted in a choice for adoption.

CONTINUOUS brakes of one kind or another have been placed upon 32,052 passenger-train vehicles in Great Britain, and there are 18,460 vehicles without such brakes.

American Railroad Journal.

A MONTHLY MAGAZINE AND REVIEW.

(ESTABLISHED IN 1831.)

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NEW YORK, DECEMBER, 1885.

Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

BOTH SIDES OF THE STATEN ISLAND BRIDGE QUESTION.

IF the recent traffic agreement between the Baltimore and Ohio and the Staten Island Rapid Transit Company is a genuine one—and its genuineness is doubted in some quarters—in its attempted fullfilment there will be a vigorous struggle not confined to rival railways, but national in its importance. It may be reasonably expected that the Pennsylvania road will bitterly oppose the projected line of the Baltimore and Ohio, in which it will be seconded by the Lehigh Valley and other interests; while the New York roads will, in general, support the efforts of the Baltimore and Ohio. Were the struggle confined to these great railway corporations there would be little in it different from the usual warfare accompanying ordinary railway projects of any magnitude. But the necessity for bridging Staten Island sound in order that the Baltimore and Ohio may make its terminal connection brings the two states of New York and New Jersey into direct conflict, and this conflict will be fought in the halls of congress.

On the part of New York it is claimed that there is no justice in New Jersey's opposition to the bridge. Staten Island, with its magnificent stretch of water front, has been shut off from the main land simply through the unwillingness of New Jersey to prosper the interests of the empire state. The water front on the Jersey shore facing New York City is controlled by a few railway corporations who practically monopolize the traffic and can have things pretty much their own way. A chance now occurs to develop the north shore of Staten Island and to put a check upon the aggrandizement of the Pennsylvania road. New Jersey selfishly interposes her objections, and congress is appealed to in the interests of common sense and justice to sanction the scheme and overrule New Jersey's opposition. So much for New York's side of the question, and it must be confessed there is a good deal of reason in the argument.

On the other hand, in the construction of the bridge New Jersey has to face a serious blow to state pride and importance. To the good inhabitants of our sister state Staten Island has been a bitter subject of reflection for two or three generations. By every law of geography the island was Jersey soil. The broad Hudson flows between it and New York, and there is no apparent reason why the state line should veer at the kills and cut off the verdure-clad hills of Richmond county from its rightful owners. The original commissioners, by an ingenious and not overly honest construction of fact, contended that the channel of the Hudson river was the state line, and that this channel ran to the westward of the island. Having so chosen and having thus cut off the immediate harborage of New Jersey and relegated it to the creek-like shores of Arthur

kull, or Staten Island sound, and New Jersey having accepted this manifestly unjust division of territory and, laboring under these disadvantages, constructed terminals of its own on these uninviting shores, it seems hard for her to be robbed of these few advantages. It has stung the inhabitants of the state to hear it alluded to as a "towpath between New York and Philadelphia," and fortunately there were instances of independent terminals which assuaged the wounded pride of Jerseymen. The construction of the bridge would render the state more "towpathian" than ever, and several of her railway industries would be crippled beyond hope. "Give us Staten Island," say the Jerseymen, "and you may build the bridge." And certainly there is method and reason in their argument.

But beyond mere questions of state pride there are other operating reasons, pro and con, relative to the proposed connection. It is undoubtedly true that the terminal facilities on the Jersey shore are cramped and meager, and are held by but few corporations who work them for what they are worth and indulge in the process of freezing out formidable rivals. The Baltimore and Ohio, a powerful railway, has been denied access to the shore facing New York save on most humilating terms. The shores of Staten Island afford an admirable opportunity for extending these facilities and striking a blow at the monoplies which control the shorage.

On the other hand, the construction of the proposed bridge would work incalculable injury to the navigation of Staten Island sound, and it is a fact that, small and insignificant as may seem this narrow stretch of water, more vessels pass through it every year than pass through the Narrows. It is the first of the chain of inland waterways between New York and the south, and the bridge would be a serious impediment to its navigation.

Of one thing we are convinced, and that is that the Baltimore and Ohio had better secure another string to its bow. The construction of the bridge will be bitterly opposed by the Pennsylvania and allied roads, and by the vast bulk of the people of New Jersey. It is doubtful if the congress has the power to do more than permit the construction of the bridge; it is claimed that its part in the business is merely passive and the opposition of the state of New Jersey can render this permission valueless. But even if the law is differently construed and the bridge is finally built, it is difficult to see how the Baltimore and Ohio is going to obtain permission to construct its eighteen miles of road between Bound Brook and Elizabethport and so connect with the bridge. It has been stated that the Pennsylvania road has unduly influenced legislation in New Jersey, but if we are not mistaken it will on this occasion, without occult means of argument, find in the state a ready ally.

Mr. ERASTUS WIMAN, the enterprising railway magnate of Staten Island, has publicly announced that he asks nothing from New Jersey, and that the bridge will be built and his projects carried through without Jersey's consent; but we would advise Mr. WIMAN to go slow. He is, as we understand, a Canadian and cannot be expected to comprehend the cherished theory of states' rights; but we would advise him to adopt a more conciliatory tone. He will find New Jersey a state with a good deal of spunk, and if he has any hopes of accomplishing his project it would be well not to tread upon New Jersey's bristling tail. He may yet be an humble suppliant for favor at her hands.

1885.

THERE is every reason to believe that in bidding farewell to the closing year we are bidding farewell to the darkest period of commercial and financial depression. The outlook for a revival of trade is encouraging, the dullness and apathy characterizing every feature of industry has been shaken off, and cautiously and tentatively, but nevertheless with considerable confidence, every branch of trade is preparing for the dawn of a brighter period.

The year 1885 has been a dull one as was predicted, but it required little power of foresight to make the prediction. The country had for once realized that progress could be overdone. To use a homely metaphor, the griddle cooked faster than the people ate, and in the past year we have suffered from the overzealous haste of our capitalists to keep abreast with the times. They have done more—they have outreached the times.

It is needless to allude to the patent fact that the outgoing year has been the dullest railways have known for a decade. Railway construction seems to have reached its lowest ebb and railway bankruptcy its highest. Ruinous competition has forced many a road to the wall, and there are now a number of roads in operation which could be put to the best possible use by tearing up their tracks and selling them for old iron. But the year has, nevertheless, been a wholesome one and has taught the railway world some severe and needed lessons. For one thing it has directed public attention to the evils of paralleling, and inaugurated a movement to kill such schemes in the future. It has taught railways the advantages of conservatism, and there will be fewer hot-footed railway projects floated in the future. It has taught the legislatures the necessity for deliberation in the bestowal of charters, and it has taught the courts the imperative need of improvement in the methods of handling insolvent railway corporations. All these are useful lessons and there is every reason to believe they will not be forgotten—at least during the present generation.

Not alone in the world of business has the year been

one of sad retrospect, but in the every branch and calling of life. The necrology of 1885 includes great and powerful names in church and state, in trade and finance. Successively died at short intervals, GRANT, McCLELLAN, and HENDRICKS, names prominent in the country's history. The powerful head of the Romish Church in America, Cardinal McCLOSKEY, is also numbered among the honored dead, and the last month of the year has seen the death of VANDERBILT, the richest man the world contained; the man whose power and influence was felt in every railway in the land.

It has been a dreary and sorrowful year, and we turn from it to greet, with renewed trust, the dawn of 1886. After the shadow comes the sunshine, and the gloomy experience of the past prepares us with keen appetites for the era of prosperity that cannot be long delayed, and which we fondly trust and believe is to be ushered in with the New Year.

EDITORIAL NOTES.

THE enormous wealth of WILLIAM H. VANDERBILT, while not the only instance of great fortunes made in railway investment, is the most conspicuous. The old Commodore had read the signs of the times with unerring accuracy, and having left his son nearly one hundred million of dollars, the mere cumulative power of money alone would have of itself doubled the fortune in a dozen years. His son's discretion shortened the period of increase, and it is to the latter's credit that the fortune was doubled honestly. The time is past for the accumulation of such immense wealth through railway speculation, and it will be many years before the world again sees as rich a man as VANDERBILT. That the times have changed, and for the better, is evident from the fact that the death of this man—the most powerful railway magnate in the world—caused little stir in railway circles, and his immense property is quietly divided without a flurry in the stock-market.

* * *

AND coincident with the death of VANDERBILT comes the report that JAY GOULD is to retire permanently from Wall street. The fact that JAY has announced his intention to retire is not, to some doubting minds, sufficient cause for belief, but it were a consummation devoutly to be wished. The true interests of railways would be better served if this rather secretive gentleman should conclude to enjoy the profits cf his numerous speculations in seemly retirement. And there are several other gentlemen of his same ethical make-up, whose retirement from the purlieus of Wall street would not increase the deviousnous of that financial alley. The railway world has had enough of speculation for some time to come.

A CORRESPONDENT of a German railway paper advocates the division of railway fares into six classes. In England they have three classes but that is not sufficient for our German friend and he desires a still further classification of the passengers, But why stop at six classes? There is no limit to the number of classes that the truly brilliant mind may create. There may be the drunken class and the sober class, the smoking class, and the non-smoking class, the male class and the female class, the rich class and the poor class, the married class and the single class—in fact, the vision of classes is illimitable.

* * *

A MOST gratifying signal of revival is the railway enterprise that is awakening in the south. That long divided section of the country, laboring under the disadvantages of an unsuccessful war and consequent poverty and general misery, is capable of wonderful development, and it is now waking up for the first time in twenty years. When railway construction is again pushed with healthy vigor the old south, or rather the "New South," as it is not inaptly called, will offer a fruitful field to the railway investor. But there is plenty of time for careful deliberation. The matter of southern railway construction can easily be overdone.

* * *

COMMENCING with the January issue, the *Railway Purchasing Agent* disappears, and our bright and enterprising Chicago contemporary will hereafter be known as the *Railway Master Mechanic.* The new title of this publication is much better than the old, and at once gives it a pronounced and useful field of operation. It has been rather surprising to us that among the multitude of railway publications none have yet secured so valuable a title, and we wish our contemporary all the success it deserves, which is wishing it a great deal.

* * *

THE American Committee of the Statue of Liberty have made an appeal to the public for $40,000 to erect the statue. While the success of their endeavors to raise the necessary amount is devoutly to be wished, and while it is the duty of every American to aid them all he can, there is nevertheless a feeling prevalent that the committee have not been altogether open in their statements to the public. Less than a year ago it was stated that $100,000 were necessary to complete the pedestal, and the *New York World* proceeded to collect the amount with commendable enterprise and energy, and succeeded. Now comes the announcement that another large sum is needed to erect the statue; and, for all we know, when the statue is erected there will be a call for a further amount to do something else. The committee could have easily stated in the beginning that they wanted

$140,000, and probably the *World* would have raised the whole amount with as little trouble as it raised the pedestal fund. It is certainly very discouraging to the American public, who thought that when they were contributing to the pedestal fund they were meeting with the last expense, to be told that other work must be done; and it seems as if in the end congress will have to make an appropriation, which is after all, perhaps, the best way out of the difficulty.

* * *

As we remarked last month railway accidents are bound to occur, despite the utmost care on the part of railway officials to prevent them. Derailments are of frequent occurrenee, and a serious one recently took place on the Canadian Pacific Railway, accompanied with severe injury to the rolling-stock and discomfort to the passengers, though fortunately no lives were lost in the catastrophe. Of course attention to road-bed and track will avert many such disasters, but would it not be equally well for railways to forestall their occurrence by providing safety appliances on their rolling-stock, so that if derailments do occur the resultant injury to cars and passengers can be lessened, if not entirely averted? In the construction of safety-truck appliances the railway inventor has a fruitful field.

* * *

THE *Railway Age* is carrying the war into Africa and is urging the adoption of "Rd." and "Ry." as the abbreviations of "railroad" and "railway," respectively. In this effort we join hands with our esteemed contemporary. We go further and say that a decision should at once be reached as to whether railroad or railway should be the generic name. Every argument seems to point to the superiority of railway, and we have uniformly adopted it in our columns, though with seeming inconsistency our publication is denominated the RAILROAD JOURNAL. For this another generation is responsible and were not our bump of veneration so prominent we would even at this late day substitute the euphonious "railway" for the cumbersome "railroad" which for sixty-five long years has stood at the head of our columns.

* * *

SHEEP-KILLING is stated to be a popular sport on western railways and the Virginia City, (Nev.) *Chronicle* reports the achievement of an engineer on a train near Reno, who killed forty sheep out of "a possible seven hundred." Well, if an engineer must kill something let us rejoice that he is content with sheep and doesn't gratify his sanguinary instincts by the slaughter of passengers.

* * *

AN English railway company has passsed a regulation requiring all its employés to wear a red neck-cloth, thus insuring them the possession of a danger-signal always at hand. The company in a burst of generosity has also furnish these neck-cloths "free gratis for nothing." It is an admirable idea and we would supplement it with the suggestion that the company also furnish its employés with white pocket-handkerchiefs to be used as safety-signals.

Outing completes the year with an admirable number, and the career of continued prosperity which seems to have waited upon this publication of a modest beginning is truly wonderful. While in its reading matter it is lighter than the leading monthlies, it is edited with discretion and skill, and artistically ranks among the best of them. The frontispiece, "December," is a work of art, and its accompanying poem fully merits the prominence given it. In furnishing light yet good literature *Outing* is fulfilling an excellent mission.

AMONG its illustrated series of "Artists' Homes," the January issue of Cassell & Co.'s *Magazine of Art* contains an article on the cottage of the well-known artist, Mr. Harry Fenn, at Montclair, N. J. Among others, illustrated articles on "A Polish Village," "Art in Assyria," "The Upper Medway, and "Beds and Bed-Rooms," contribute to render the number an excellent one. A spirited colored frontispiece, "Cranes," taken from a painting in the British Museum, accompanies the issue.

THE December *Century* contains a very valuable contribution to naval literature in a paper by the veteran Ericcson on "The Monitors: their Construction and Work," fully illustrated with fine wood engravings. The paper is supplemented by an interesting account of "The Loss of the Monitor," by Francis B. Butts, one of the survivors. Among the remaining articles of interest is a beautifully illustrated description of "The City of Teheran," written by S. G. W. Benjamin.

THE Christmas number of *Building*, an architectural monthly published by William T. Comstock, at 6 Astor place, New York, is an issue to be commended in every respect. The accompanying designs show taste in conception and execution, and the letter-press is of more than usual interest.

Sechrist's Hand-Book and Railway Equipment and Mileage Guide continues to furnish monthly a valuable amount of railway statistical information that cannot be obtained elsewhere. It is published in Cleveland, Ohio, and not in Chicago as erroneously stated in the October JORUNAL.

THE Almanac for 1886, published by the *Philadelphia Record* for its subscribers, is far in advance of ordinary publications of the kind. It is handsomely illustrated and contains a large amount of statistics and other valuable information.

The Mining and Scientific Press, an illustrated journal of mining, popular science and general news, is published in San Francisco, and appears to be meeting with deserved success.

The Insurance Critic, published in this city, is an able monthly journal devoted to the interests of legitimate life and fire insurance.

The American Inventor, devoted to industrial interests, art. science and manufactures, is an interesting monthly journal published in Cincinnati.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

STREET-RAILWAY CONSTRUCTION IN NEW YORK CITY.

THE marvellous success attending the operation of the Broadway surface road has caused the birth of many street-railway schemes in New York City. Half-digested plans are rushed into print and charters sought for roads to be built on vacant streets that in many cases offer little chance for profitable operation. But the fever has taken hold and New York will have its fill of street-railway schemes even if the numerous projects come to naught.

That street-railway construction is needed in New York no one can deny. As yet, below Walker street, there is no means of cross-town travel in the city, and while two charters have been granted for the construction of cross-town roads in the lower portion of the city it is not to be expected that the promoters of these enterprises will be allowed to construct their roads without strenuous opposition in the courts by others who are nursing similar schemes. The Chambers and Grand street Ferry Railroad Company had no sooner begun the laying of their tracks than they were enjoined by the courts at the instance of a rival organization and the promoters of any new road must look for similar obstructions.

The Fifth avenue railway scheme seems to have met with a decided check and the adverse report from the aldermanic railroad committee has rather dampened the ardor of the street-railway speculators. We have no wish to ascribe to the honorable the board of aldermen motives which they do not possess, and we do not labor under the apprehension that they have the welfare of the city at heart. Their adverse report was simply due to the fact that a certain senatorial committee, yclept the GIBBS committee, have been prying in rather an impertinent manner into the peculiar methods of the city departments, and with the probable investigation of the granting of the Broadway franchise in view our city fathers have thought it well to assume a virtue of they had it not.

In the upper part of the city the air is rife with rumors of new street-railways, and the idea is fast gaining ground that street-railway construction and operation is a sure road to profit. Of the numerous routes suggested but a small number afford outlooks for profit, and it is nearly time a halt was called in the matter of street-railway construction in New York. For many years the city has done without roads that were a necessity, but there is no reason why all at once there should be a deluge of new projects and a series of expensive legal combats between capitalists to obtain charters for roads that could scarcely be expected to prove profitable. True, the expense of this litigation does not fall upon the people, but a reaction is certain to follow the feverish street-railway agitation and the true interests of street-railways as well as those of the city will suffer from it.

In truth the construction of the Broadway surface road is responsible for this sudden awakening. The enormous profits which this road will unquestionably earn, the ease with which its franchise was obtained from the board of aldermen and the unwholesome scandals attending it have done much to unsettle the public mind, and two strong parties have been developed—the street-railway party and the anti-street-railway party—the first rushing hastily into any wild speculative street-railway project and the latter unreasonably opposing any contemplated street-railway construction.

For the true benefit of street-railways in this city there should be two policies pursued. There should be a searching investigation into the circumstances attending the granting of the Broadway franchise and a temporary cessation of street-railway construction until the public mind crystalizes and it can be ascertained what the city really needs. From the GIBBS committee there is little to expect. It is composed in part of the lowest order of machine poiticians, and the shifting, evasive action of its chairman on the question of examining the granting of the Broadway franchise betrays a desire to avoid the subject altogether. In all probability the incoming legislature will appoint a new committee and the matter will be thoroughly sifted, for the public mind is so aroused that the Albany solons will not dare refuse to investigate the subject.

Regarding the second step—a cessation of street-railway agitation—there is reason to believe that it will take place, owing to the strong opposition that the public is showing to the free bestowal of franchises; and when affairs have been straightened out, and the public and the street-railway projectors can agree, we may look for some wholesome activity in street-railway construction in this city.

WE present this month the first of the reports of special committees submitted at the recent convention of the American Street-Railway Association. It is a careful analysis of the vexed questions appertaining to the establishment of rules for the guidance of conductors and

drivers, and its conclusions are the results of the long experience of several prominent street-railway officials. As such it will merit attention. The remaining reports will appear in the JOURNAL in as short a time as possible, and when they are exhausted the reports and papers read at the recent convention of the Ohio State Tramway Association will be given space. Altogether there is a large fund of instructive matter in store for the street-railway readers of the JOURNAL.

* * *

THE first street-railway in the state of Vermont was opened for passenger-traffic at Burlington, on November 13th. There has been a race between Burlington and Rutland to achieve the honor of opening the first street-railway in the commonwealth, and Burlington has won, though the Rutland road is announced as approaching completion. This rivalry is very pleasant and commendable, but it strikes us as a little singular that so old a state as Vermont and one so comparatively thickly settled should be without a convenience that is common to every little one-horse town in other states.

THE FUTURE OF THE CABLE SYSTEM.

BY A. J. MOXHAM.

[Written for the AMERICAN RAILROAD JOURNAL.]

IT has almost become an axiom that none but the giants among street-railways can afford the cable system. Its first cost is almost prohibitive. The recent history of its development seems to support the axiom. During the last few years it has been introduced on the level streets of Chicago, St. Louis and Philadelphia, justified by heavy passenger-traffic, either promised or existent, and into Kansas City, Cincinnati, and on Tenth avenue, New York, necessitated by heavy grades. In Chicago the type of construction adopted was what is known as the Hovey modification of the Hallidie system, and all others embody the same main features. In Philadelphia the modification is known as the Bonzano system, in New York and Kansas City as the Miller, in St. Louis as the Boyer, and in Cincinnati as the Lane. Of them all the type of construction as worked out in the Lane system in Cincinnati is perhaps the most thorough, mechanical and economical in first cost.

The cost of these roads completed, exclusive of power, station and equipment, will average not less than $75,000 per mile, single-track; the extremes being in Chicago, a cost of $105,000, per mile and Cincinnati, where timber was used for the conduits, about $40,000 per mile.

I do not purpose in the following lines to take the part of *primo uomo* on behalf of the present cable system, though a firm believer in its outcome. I purpose to dwell upon the hope that there is in this outcome by taking a pessimist rather than an optimist view of the system of to-day. To those who have not investigated the system thoroughly, its first cost is a matter of astonishment. To those who have done so, it is rather a warning to wait—to "bide the good things coming." *It is, on its face, a false cost.*

Let us take $75,000 per mile of single-track as an average. Let us assume that a horse will average 16 miles a day at a speed of 7 miles an hour and the cars are run with a minute-and-a-half headway for 16 hours a day, all of which is excessive. A cable on a mile of such track will replace 80 horses. I confidently assert that in no other known instance of general use, either in mechanism or construction, does it cost as much money to mechanically replace 80-horse power.

The present system may be defined as a very small cable running through a very large hole; and that very large hole can best be described as running through the investor's pocket-book.

There are three considerations which principally govern the size of the conduit:

1. Capability to properly carry the distributer of power—the cable.
2. Capacity enough to provide for drainage.
3. Capacity for passage of the car-connection.

We will look at these:

1. Passage of the cable.—On the face of it a small requisition. It is only necessary to provide clearance for the natural dip of the cable between pulleys, and this, in its turn, is capable of control by means of driving and tension apparatus which can be increased if desired in numbers, in tension, or in both.

2. Drainage.—Also, as compared with the size of the present conduit, a small factor, and one for which we have a precedent in the street gutter. As the conduit is itself sub-drained by connections to the main sewer, which can be made at frequent intervals, greater capacity is not called for; certainly not for liquid drainage, and as for solid obstruction it must be remembered that the nearer the surface the more easily is such obstruction handled.

3. The car-connection.—This at present is the main cause of the large conduit. In the present system it consists of vertical shanks passing through the slot and connecting with the cable by a complicated enlargement inside the conduit. As I before stated, I will not go into details of construction but rather seek broadly to learn its promise.

Size has in this case been the result of its complication. Is is well to note that the grip of to-day was originally of small compass and simple construction. Piece by piece has it been added to and built up. Its many parts have contributed to a great weight; that weight by an increase in the inertia of the grip contributes to excessive side wear during passage through the slot, which in turn demands provision for that wear. There seems little hope of decreasing either the size or the weight of the present type of grip. The tendency seems rather to further increase. It would seem that this alone would tend to stamp the present grip-connection as faulty in its conception.

Again, arguing *a posteriori*, let us ask if all this complication be needed, why locate it where of all places it will cost most money? That many points have to be cared for in *any* car-connection, no matter what the system, no thinking man will deny. It must be more or less flexible, it must be capable of an adjustment independently of the car, of rapid separation and entire detachability from the cable. Indeed before it can be pronounced thoroughly

successful we must go a long stride ahead of the present grip, and make it entirely detachable from the slot and conduit at any point in its travels. But cannot all this be done without putting the vital and complicated parts *into the conduits?* It costs nothing for space if carried in the open; the weather wont worry it. Then why go to the expense of constructing a big hole in the ground to keep you from taking care of it? Providence never yet put a man's brains into his belly. The advocates of what will soon be known as the "old school" (but not "of Masters") urge that it will not do to lift the cable out of the slot, so the grip must go to the cable. Very true. "As the mountain won't come to Mahomet, Mahomet must go to the mountain." But unfortunately the present system makes a mountain out of the grip and upsets the Koran by sending it to Mahomet after all. To contend that these rational changes *cannot* be effected, seems to me a libel on the inventive skill of the most inventive people on the globe; and to urge that they *will not* be effected when conducive to so much economy, a libel on the thrift of our capitalists, lack of which is not one of their characteristics.

I have thus criticised the grip of to-day because, as pointed out, it seems to be the *pons asinorum* of the present system. This reduced within reasonable and mechanical limits permits of a smaller conduit, and with this the real economy available stands revealed.

There is one limit to the depth of the conduit, to which the practical and economical instincts of the street-railway man turns, as does the Mohammedan to Mecca. *It should not interfere with or cut through the cross-ties.* And so far as the future development of the system is concerned there seems no vital impossibility in carrying through these reforms.

One word as to the cable itself. So far it has cost about $1,200 per mile of single-track and lasted an average of about 15 months. In a line 20 miles long, this is an addition to yearly operating expenses of $19,200 per annum. At 8 per cent. interest it would pay to invest one hundred and twenty thousand dollars to make this cable last twice as long, and one hundred and eighty thousand dollars to make it last four times as long. There is one fact patent in this connection. It is that the use of a cable for street-railway service subjects it to totally different treatment from that of any other use it is put to, and consequently it demands and will doubtless evolve a cable of a new and different type—one that will meet the special requirements of this use.

There are many who, at first enthusiastic in their hopes about the system, have lost all interest in it on learning its great first cost. To such I would urge that there are two powerful stimulants tending to reduce the cost to such a point as should renew their interest:

1. The system is costing $50,000 per mile more than it should cost, and there is consequently a standing premium of $50,000 acting as an incentive to cut down its cost to a normal figure.

2. It is the right thing and wanted badly. There is an appetite for it.

In his "Noctes Ambrosianæ," John Wilson thus speaks through two of his characters:

Tickler (who has the blues).—I wish I was dead.

Shepherd of Ettrick.—You dinna wush ony sic thing Mr. Tickler. That appeteet o' yours is worth five thousan' poun' a year. O mon, it would be a sair pity to dee wi' sic an appeteet.

So with the cable system, there is an appetite for it. "It would be a sair pity to dee wi' sic an appeteet."

And it won't.

RULES GOVERNING CONDUCTORS AND DRIVERS.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

EVERY street-railway enterprise is dependent for its success upon its location and management, and the management is very largely dependent for its success upon the character and conduct of the conductors and drivers employed.

These servants are the real representatives of the company before the public, and just in proportion as they are civil, polite and attentive, or the reverse, will the company obtain favor or disfavor with the public. They are also the trusted servants of the company for its revenue and upon their watchfulness, fidelity and honesty depends in a great measure the financial success of the enterprise.

It is, therefore, of the utmost importance that good men should be selected for these positions, and equally important that good rules and regulations should be the guide of their conduct—such rules as will commend themselves to the judgment of reasonable men, and such as will conduce to the orderly conduct of the business and the comfort, convenience and safety of the public; not only that portion which rides in the cars, but of the large number of pedestrians and teamsters. The streets are for the whole public, and while the street-car is given by law the right-of-way it should always be taken in the least objectionable manner consistent with a proper conduct of the business.

To one who has examined the rules in force in different sections of this vast country, it is obvious that no complete set of rules could be drafted which would meet the local requirements in all respects, and no attempt at such a compilation will be made by your committee, but its recommendations will be confined to such general regulations as seem, from a careful survey of the subject united with a long experience, to be applicable alike to all sections.

The rules should be made as concise and as complete as possible, should be issued in convenient form to be carried in the pocket, and as discipline is one of the first essentials in the correct management of any body of men they should be rigidly enforced. It should be made obligatory upon the men to carry the rules at all times when on duty. Ignorance of a rule should be no excuse for its violation, and wilful or careless violation of their provisions should be made sufficient reason for their discharge.

Rules are are properly divided into three classes, viz.: *Discipline and Deportment; Comfort, Convenience and Safety of the Public*, and *Collection of Fares*, and we shall treat them in that order:

DISCIPLINE AND DEPORTMENT.

The conductor should have charge of the car and any disobedience of orders or infringement of the rules on the part of his driver should be reported.

Starting behind time, loafing or too fast driving, driving fast in going on or off turnouts, around curves and over railroad crossings; failure to answer the bell promptly or to stop the car properly; stopping the car

across intersecting streets or over cross-watks; failure to keep a sharp lookout for passengers in main and cross streets; failure to signal promptly and accurately for passengers who get on at front end of car; carelessness in driving; permitting unauthorized persons to drive; the use of profane, boisterous or indecent language, or the use of intoxicating liquors are all matters which a conductor should promptly report to relieve himself from responsibility.

As it is important that these employés should be neatly dressed, and as taste in the matter of dress differs so radically, it will be found advantageous to prescribe some neat uniform to be worn at all times when on duty. This will add not only to their general appearance, but to their efficiency as well. A numbered badge should be worn at all times when on duty and in a position to be plainly visible.

They should treat each other with respect, be cautious and considerate, guarding themselves against envy, jealousy, or other unfriendly feelings, refraining from all discreditable communications except to those in authority and upon such matters as it is made their duty to report. They should use no vulgar, profane, improper or ungentlemanly language, nor be guilty of any ungentlemanly conduct upon the car to passengers or others, nor upon the company's premises.

They should be civil, courteous, polite and attentive to passengers at all times, be patient and answer any reasonable request of passengers, and direct strangers and others when requested the nearest and safest way to their place of destination. They should abstain entirely from the use of intoxicating liquors, and should not frequent any place where the same are sold. They should not accept any fee, gift, treat or entertainment of any kind from each other or from any employé of the company. They should attend punctually at the stable to take out their cars, remain with them at all times when *en route*, conform to the running time as near as possible and always stop and start the car by the prescribed signal. The signal in most general use is one bell to stop and two bells to start, and upon open cars it is customary and advisable to permit the use of a whistle for signals. The driver should signal the conductor by one bell for each passenger getting on at the front end after the first collection of fares. Other signals for putting on the rear brake, for increasing speed or to stop suddenly are usually provided for and will be found useful in an emergency. Every conductor should carry a watch, keep it exact with the office time and start his car from each terminus promptly at the advertised time.

The proper position for a conductor when not otherwise engaged in the performance of his duties, is upon the rear platform, standing erect and on the watch for persons desiring to take the car. He should not engage his attention in reading, in unnecessary conversation with passengers, nor in any way which would interfere with a correct and prompt performance of his duty.

The driver should stand erect with right hand on brake-handle, controlling his horses with a taut rein, keeping a vigilant watch for persons who may desire to take the car, not only in the main but in side streets, and at the same time with a careful eye to avoid collision with pedestrians or vehicles, and should always speak pleasantly to teamsters when requesting them to move. They should both be ever on the alert to advance the company's interests and always ready to assist each other in any emergency. Cars when heavily loaded should not be stopped on steep grades nor upon curves, except to avoid accidents. Jumping cars from the track should not, as a rule, be allowed; on a single-track it is more advisable to change cars or to run back to the nearest turnout.

When necessary to eject a passenger for any cause, the aid of a police officer should be employed if possible. No more force than is absolutely necessary should at any time, in such cases, be used and the names of reputable witnesses should be obtained. Suitable blanks should be furnished to be filled out in case of accident, and upon which a full statement should be at once written and delivered promptly at the office. Articles found in the car should be promptly turned in at the office with accompanying memorandum giving particulars.

SAFETY, COMFORT AND CONVENIENCE OF THE PUBLIC

The conductor comes in more direct contact with the public than the driver, and while many rules are only applicable to him the driver should should at all times coöperate with the conductor, as far as he can, in carrying out the rules in their spirit and intent.

The car should be kept clean and the lamps trimmed at all times, but it will in most instances be found more advisable to provide special labor for this purpose rather than to make it a part of the duty of the driver and conductor. Special assistance should be given to ladies, children, and elderly or crippled persons getting in or out of the car. Seats should always be provided as far as possible. During cold and stormy weather the doors should be kept closed as much as possible. The rear platform should be kept as clear of passengers as possible and children should never be allowed to ride upon either platform. Passengers should not be allowed to stand in the doorways or upon the steps when it is possible to avoid it. Passengers should be requested to alight at the rear end from the side nearest the walk. When a lady leaves the car, care should be taken to observe that her dress is entirely clear from the platform and step before giving the signal. Whenever the car is stopped at the request of any passenger, care should be taken to observe that every other person upon the car is in a position of safety before giving the signal, and passengers should be cautioned and prevented as far as possible from leaving a car while in motion. Expedition in receiving and landing passengers is always desirable, but never at a sacrifice of safety to individuals.

Disorderly or otherwise obnoxious persons, whether or not under the influence of liquor, should not be allowed to ride upon a car, and any one perceptibly under the influence of liquor should never be permitted to ride upon the front platform.

Smoking, the carrying of dogs, and the distribution of hand-bills and peddling in the cars, are all matters which should be regulated by rule. The names of principal streets, hotels, depots, ferry landings, public squares and places of amusement should be distinctly announced as the car reaches them. Provision baskets or soiled and greasy bundles should not be allowed inside a car, and not outside to the inconvenience of passengers or injury to cars. Nothing should ever be hung upon the rear brake-handle. The car should always be stopped a reasonable distance before crossing a steam railroad track at grade, and the conductor in the absence of a flagman should go forward and give the signal to the driver to advance. If inside the car, the signal to go ahead should not be given without inquiry if all is right and receiving an affirmative answer. Passengers should be notified of any approaching danger, as an obstruction in the street.

The liability to accidents on open cars is much greater than on box-cars, because of so many places of entrance and exit, and consequently the very highest degree of care is necessary when running them.

COLLECTION OF FARES.

There are probably few if any companies to-day who do not provide some sort of registering device to be used by the persons responsible for the collection of fares, and the rules governing the collection will depend upon the device used.

As a rule, the conductor should commence to collect fares at the front end and work to the rear. After fares have been once collected the driver should signal by one bell for every person getting upon the front platform, and additional fares should be collected as soon as passengers reach the place in the car to which they intend to go.

Each fare should be registered at the exact place where it is taken, in the presence of the passenger paying it and before another is collected. Where fare-boxes are used the driver is also the conductor and should not be permitted to handle the fares, but should see that every passenger's fare is deposited in the box.

Having completed a set of rules to his satisfaction no railroad manager should stop there; rules, no matter how good, will not enforce themselves, but the better the class of men employed the easier will it be to enforce good rules.

Drivers and conductors should be not only faithful but intelligent, for they are very often called upon to use discretion in matters which it is impossible to cover by the rules.

As far as possible these employés should be selected from among the residents of the city or town in which the road is located, and such as are favorably known and endorsed by reputable citizens of the town. When first employed they should not be less than twenty-one nor more than forty years of age, energetic and of good habits. The pay should be sufficient to attract and hold such men, and their hours of labors should be fixed within the bounds of reason.

Fourth Annual Meeting of the Ohio State Tramway Association.

THE fourth annual meeting of the Ohio State Tramway Association was held at the Boody House, Toledo, Ohio, on November 18th, under the auspices of the Consolidated Street-Railway Company, of Toledo, and was a most successful gathering. Delegates were present representing street-railways in Cincinnati, Dayton, Springfield, Columbus, Cleveland and Toledo. The meeting was thoroughly interesting and the papers read, as announced in the September JOURNAL, exceedingly valuable and in-

structive. Resolutions were adopted calling for information and statistics on: "Amount, Kind and Frequency of Feeding Horses," "Causes of Accidents"—for classification, to guard against recurrences of them, and "Insurance Premiums and Losses." Through the courtesy of Secretary Richardson of the American Street-Railway Association full information was furnished on the latter subject.

The following officers of the association were elected for the ensuing year:

President, C. B. Clegg (secretary, Dayton Street-Railroad Company, Dayton); Vice-President, Joseph Stanley (vice-president and superintendent, Broadway and Newburg Railroad Company, Cleveland); Secretary, H. A. Everett (secretary and treasurer, East Cleveland Railroad Company, Cleveland); Treasurer, W. B. Hayden (director, Columbus Consolidated Street-Railway Company, Columbus); Executive Committee, the above-named officers and A. E. Lang, (secretary, Toledo Consolidated Street-Railway Company, Toledo).

The banquet of the association was held at the Boody House in the evening, at the conclusion of which the convention adjourned to meet in Dayton, Ohio, on Wednesday, November 17th, 1886.

The Philadelphia Electric Railway.

THE American Electric Railway Company, of Philadelphia, which has lately laid a line along Ridge avenue from the depot at Thirty-fifth and Dauphin streets to West Laurel Hill, made an experimental trip on November 28th. The new car, fitted with the electric motor, ran out of the depot and made a perfectly successful run to the end of the road and back to the depot.

A Cable Road in Binghampton, N. Y.

THE street-car line extension at Binghampton, N. Y., to the State Insane Asylum in that city was opened recently. The cars are drawn up a steep bluff by a cable and a speed of twelve miles an hour was obtained. The system differs from the usual cable roads, there being two cables in use and no grip being required. The inventor is Mr. C. B. Fairchild, a teacher in one of the New York public schools, and the system has been pronounced a decided success.

A Street-Railway in Newport, R. I.

A CHARTER has been obtained and the privilege of laying tracks for a street-railway asked of the city council of Newport, R. I. New York and Boston capitalists, representing about $40,000,000 of real estate in the city, protest against the line as injurious to the city's interests, and threaten to quit if it is built; certain carriage owners have also stated that they will not use streets where rails are laid. The city council will submit the question to the voters at large. Thc newspapers and most of the citizens are in favor of the railway.

The Brooklyn Elevated Railway.

THE first quarterly report of the Brooklyn Elevated Railway Company shows an income of $94,824.35, and expenditure amounting to $79,399.14. The railway was not completed to the Fulton ferrv until after the close of the quarter. It is now doing better than before, although it does not run through the principal business portion of the city. The fare is five cents at all hours of the day or night. The company owning this small elevated road in Brooklyn are so well pleased with its success thus far, that they are trying to get the right-of-way to build two more lines in that city.

A London Tramway.

THE mileage of the North Metropolitan Tramway Company, of London, Eng., is 33¾ miles; for which there are are 220 cars, 2,000 horses, and 1,000 employés.

STREET-RAILWAY NOTES.

WORK began this month on the Chambers and Grand street Ferry Railroad in the lower part of New York City, and the track-construction was being rapidly pushed until a temporary injunction was granted by the courts on motion of the New York Cable Railway Company, who claimed that the former company were infringing upon the latter's rights and franchises. The injunction has since been dissolved.

THE Chicago Passenger Railway Company opened its line recently. It runs on Adams street from Park to Desplaines, thence south to Harrison, thence west to Western avenue. The company is running twenty-four cars morning and evening and twelve during the day, and expects to increase this number at an early date. D. L. Hough, of Chicago, is president of the company.

THE Van de Poele Electric Light Company, of Chicago, is building an electric street-railway at South Bend, Ind., and has a contract for a similar road in Detroit. It has also contracted to supply electric motors to the Minneapolis, Lyndale and Minnetonka Railroad to operate the portion of its line within the city limits.

GROUND has been broken for the construction of the Mount Vernon and East Chester Surface Horse-Railroad to connect the Harlem and New Haven Railroad and so on to its terminus at the East Chester dock, near Pelham bridge, a distance of three miles.

THE City Railway Company, of Trenton, N. J., opened its new road for operation this month. The new road branches from the main line and runs down Center street to Riverview.

THE Rutland (Vt.) Street-Railway will soon be built. Nearly all the $28,000 in bonds are disposed off, 200 tons of steel rails are ordered, and cars are being negotiated for.

IN the department of New Inventions of this month's JOURNAL will be found descriptions of a switching-wheel for street-cars, a cable-grip, and an improved car-strap.

THE Waterloo (Iowa) Street-Railway was opened November 6th. It was intended to be operated by electricity, but this has been found to be impracticable.

THE Little Rock (Ark.) Street-Railway Company has purchased the Citizens' Railway for $100,000. The completion of the new line is now assured.

WORK on the street-railway at Tampa, Fla., was commenced November 16th.

PALATKA, Fla., is to have a street-railway.

New Inventions.

Adams' Car-Brake.

GILBERT L. ADAMS, of Altoona, Pa., is the inventor of an improved car-brake, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a plan view of a car-truck fitted with the improved brake appliances; Fig. 2 a longitudinal sectional elevation taken on the line $x\ x$ in Fig. 1, just at one side of the central pivot-block or fulcrum, which is attached to the central spring-beam of the truck, and Fig. 3 a front elevation of the spring-beam and the brake devices, the wheels and other parts of the truck being removed for the sake of perspicuity. In this view are clearly shown the fulcrum-plates of both primary and secondary levers, and also the vertical arms to which the brake-shoes are attached. The brake-shoes are removed in this figure, as well as parts of the truck. Fig. 4 is an elevation of the brake-shoe detached from the other parts, and Fig. 5 a detailed view

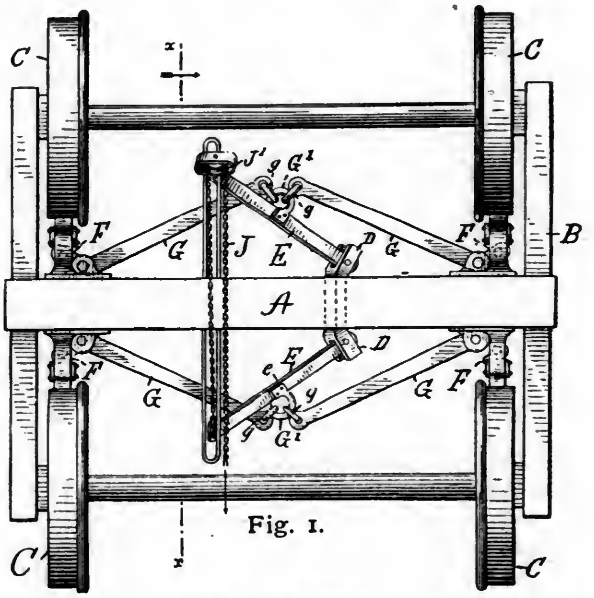


Fig. 1.

ADAMS' CAR-BRAKE.

showing a side elevation of the brake-shoe and the vertical arm to which the shoe is hung, the two parts coupled together as in use.

The truck, as is usual, has a central bolster or spring-plank A, made either in one or two parts, with end frames B, in which the axles of the wheels C, have their supporting or bearing-boxes. To the central part of the beam A, near its bottom edge if there is only one beam, or if there are two near the bottom edge of the lower beam, is secured a fulcrum-block D, one on each side of the beam, to which fulcrum-blocks are pivoted the lower ends of the two actuating-levers E. There are also secured to each side of the beam A, just inside of the wheels, two vertical arm-pieces F, one near each end of the beam. These arm-pieces provide fulcrum-blocks for the secondary levers G, as shown in Figs. 1 and 3, and also, by means of their upwardly-extending arms, attachment-supports for the brake-shoes, as shown best in Fig. 5. The brake-shoes H, are hung to the upper ends of the arm-pieces F, either by links I, as shown in Fig. 2, or, in lieu of them, an arm or connection-piece cast solid with the brake-shoe. In either case the brake-shoe is allowed a swinging or pendulous movement on the coupling-pin or pivot *i*, on which it is suspended at the top end of the arm F. The rear or outside of each brake-shoe has a pair of lugs *h*, extending rearwardly, and a small slot formed between these two lugs forms the seat of the secondary lever G. The free or moving ends of the levers G, on each side of the beam A, are coupled in an assembling-clevis G′, by a pivot or coupling pin *g*, and a slot in the other side of the

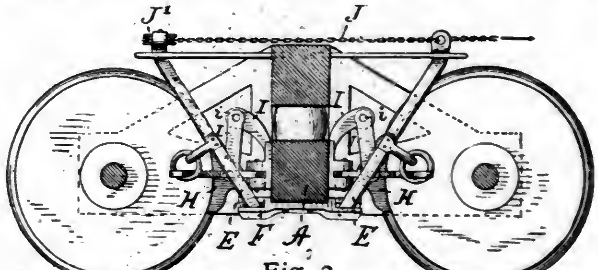


Fig. 2.

ADAMS' CAR-BRAKE.

assembling clevis-piece receives the actuating-lever E, which is connected to the clevis-piece by an assembling-bolt *e*.

As shown in the cuts, the actuating-lever E, coupled with the secondary levers G, form a set of compound levers for applying pressure to the brake-shoes. There is one of these sets of compound levers on each side of the central beam A, as shown in Fig. 1. The two sets of compound levers are actuated simultaneously, so as to apply all of the brakes of a single truck to the wheels of that truck at the same moment. For this purpose an operating cord, chain, or rope I, preferably of wire, is attached to the top end of one of the levers E, and is thence taken over to and run around a sheave J′, attached to the top end of the other actuating-lever, and thence it is conducted back to the operating brake-rod, (not shown), and by tightening up the cord or chain J, the levers E, are both drawn together, and thereby move the coupled secondary levers G, so as to apply all of the brakes simultaneously.

The fulcrum-pieces D, and the clevis-pieces G′, have several holes formed through them for the accommodation of the assembling-pins or bolts to several different positions, so as to form an adjustment or take-up for the parts as they become worn by use.

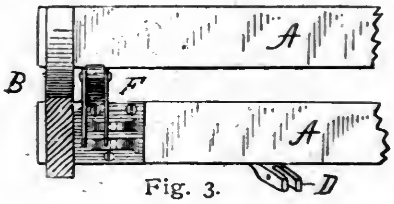


Fig. 3.

Fig. 4.

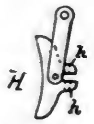


Fig. 5.

ADAMS' CAR-BRAKE.

The advantages of this brake over other brakes are claimed to be: 1. The elevation of the brake above the track or road-bed, being eight inches higher than that of any other brake—thus avoiding obstructions on the road-bed. 2. If any part of this brake, or if the whole brake, should be detached or torn off, no damage could happen as on other brakes. 3. The power gained by the use of the combined levers, etc., is claimed to be at least three times greater than that of any other brake, and a brakeman can handle the brake with but one hand. 4. The

shoes wear uniformly and are kept perfectly solid on the tread all the time, thus saving many shoes—other brakes wear the shoes uneven and making them useless. 5. The repairs to this brake will be required much less frequently, and when necessary can be made at much less expense.

The device is now controlled by the inventor and by Messrs. Alexander & Herr, of Altoona, Pa., to whom one-third the patent-rights have been assigned and to whom all communications should be addressed.

Lowrie's Switching-Wheel for Street-Cars.

HARVEY C. LOWRIE, of Denver, Col., is the inventor of an improved switching-wheel for street-cars, which is herewith illustrated and described. In this device the inventor employs a switching-flange or flange-wheel which is readily adjustable on the line of the car-axle, whereby the flange, as a switching medium, may be rendered inoperative, or if organized, for instance, to turn a car to the left hand, it being assumed that the road on which the car travels is provided with frogs adapted to coöperate with the properly adjusted switch-wheels. In what is deemed its best form the adjustable switch-wheel embodies an ordinary car-wheel, so far as flange and tread is concerned, but having at its inner and outer sides a plain annular surface, near its periphery, pierced with lateral bolt-holes, and a switch-wheel flange, which is capable of being operatively applied to either side of the car-wheel and to be securely bolted thereto, thus providing for the adjustment of the switch-wheel flange longitudinally on the line of the axle to the extent of the thickness of each wheel, and this can be readily supplemented by the interposition of rings of different thicknesses between the detachable flange and the wheel. With this construction and switch-flanges of various diameters, aud obvious corresponding variations in the rail-frogs of a street-railway system, it will be seen that any car can in a few minutes and with but little labor be adapted for service on any route.

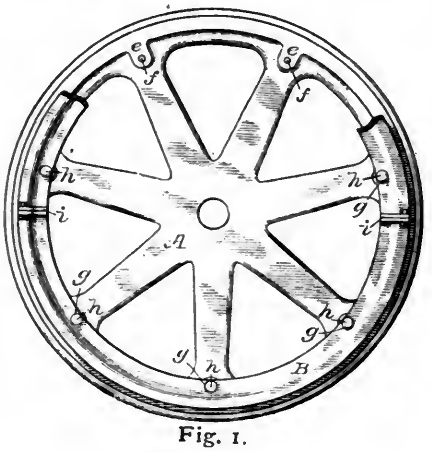


Fig. 1.

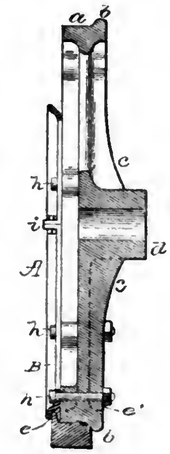


Fig. 2.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

As an equivalent for the construction stated, so far as convenient shifting is concerned, it will be sometimes found desirable to provide a switch-flange with a hub of its own, and mount it upon an axle inside of the car-wheel; but such would not embody the improvements unless it were so mounted upon the axle—as by a set-screw and key for instance—that it could be readily adjusted longitudinally on the axle.

In the accompanying cuts, Figs. 1 and 2 illustrate in side view and section a car-wheel provided on its outer face with a switch-flange. Figs. 3 and 4 in similar views illustrate a car-wheel with the switch-flange applied to its inner face; Fig. 5 is a plan view of one form of frog adapted for use with switch-wheels; Fig. 6 and 7 are enlarged views of portions of the frog, and Fig. 8 is a sectional view of a switch-flange provided with its own hub, and illustrates a method of adjustably mounting it on a car-axle between the car-wheels.

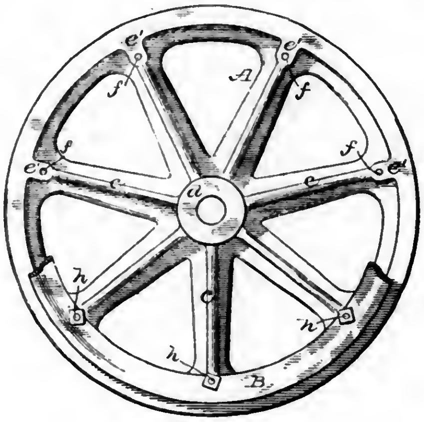


Fig. 3.

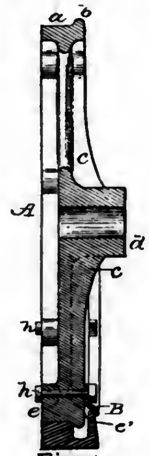


Fig. 4.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

The car-wheel A, has the usual tread *a*, flange *b*, inside webs *c*, and hub *d*. On its outer side, near its periphery, the wheel has a flat annular face or series of faces *e*, and a series of lateral bolt-holes *f*, at proper points around the wheel. On its inner face the wheel has a similar flat face or faces *e'*, these seats being the best points for the location of the bolt-holes.

The switch-flange B, may be largely varied in its peripheral contour without departure from the invention; but it must have a series of bolt-holes *g*, coincident with those on the car-wheel, and a fit surface near its periphery to admit of its being properly clamped upon the wheel by the bolts *h*. The switch-flanges may be cast in one piece or made in two or more segmental sections; but it is preferable that they be made in two parts, as shown, and formed of so-called "malleable iron," or of wrought iron or steel, and provided with lips *i*, at the joints, and tie-bolts, as shown, for greater convenience in handling, incident to their adjustment.

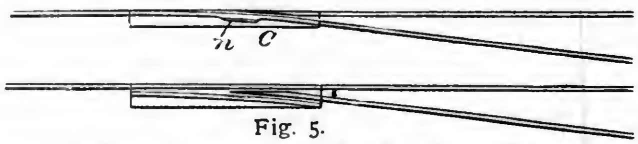


Fig. 5.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

In Fig. 8 the switch-wheel B, has its own web and hub, and is mounted on the car-axle *k*, so as to be readily adjusted longitudinally thereon. The eye of the wheel is large enough to receive the axle freely, and also to receive the key *l*, and in its hub there is a set-screw *m*. Other means for locking this flange-wheel to the axle may be employed without departure from the invention, but they must be such as to enable variations in adjustment to be made with facility.

It will be seen that by loosening the set-screw the key can be readily withdrawn, and for securing the wheel the set-screw is first turned partially into contact with the axle and the key is then driven into its seat; but it cannot be so firmly set that it cannot be readily released on turning back thc set-screw.

With the detachable and adjustable switch-flanges or the flange-wheel, as shown in Fig. 8, the frogs would in each case be constructed so as to coöperate with the particular adjustment. As, for instance, if a branch track were entered toward the right hand, as seen in Fig. 5, the

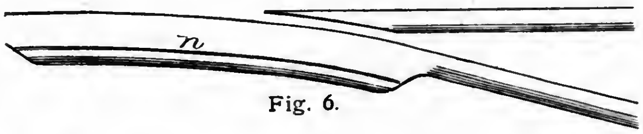


Fig. 6.

Fig. 7.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

switch-flange B, would be located on the outer side of the right-hand front wheel of a car, and when the frog C, was reached, its curved web *n*, would be engaged by the wheel-flange and cause the car to pass the frog properly. A second switch-flange on the inner side of the left-hand front wheel might be also used with a frog on that side of the track, similarly provided with a guiding-rib; but one flange and rib is usually deemed sufficient.

It will be readily seen that when cars must be temporarily run over routes other than regular it will be an easy matter to adapt them to any given route if the rolling-stock superintendent be provided with a schedule giving the number or size of the particular flanges required for each turnout on all the routes; and it will be equally

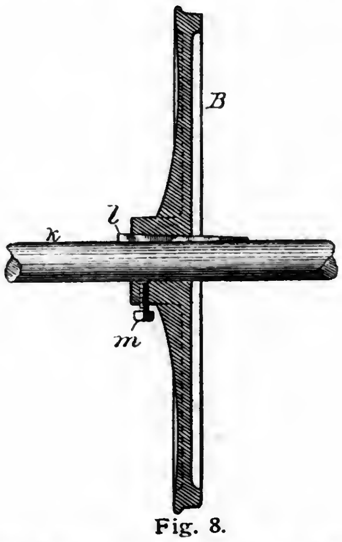


Fig. 8.

LOWRIE'S SWITCHING-WHEEL FOR STREET-CARS.

obvious that if both sides of the wheels be provided with switch-flanges a car will readily turn into properly constructed frogs, whether toward the right hand or the left, thus providing for all possible contingencies. A car whose forward right wheel was flanged outside might be turned to the right at one place, while a car whose forward left wheel was flanged inside might pass such turnout, to be guided to the right at some further turnout as desired, and so on.

Cuneo's Car-Coupling.

JOHN CUNEO, of Vicksburg, Miss., is the inventor of a new form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a bottom plan view of two of the couplings properly engaged; Fig. 2 a partial side and sectional view thereof, and Fig. 3 a top plan view of one of the couplings.

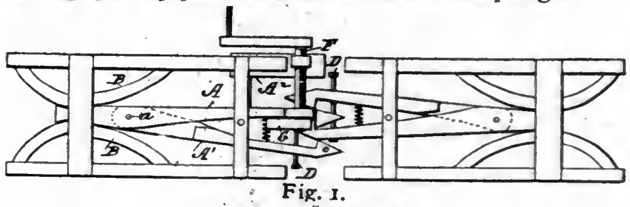


Fig. 1.

CUNEO'S CAR-COUPLING.

The coupler consists of two arms A A′, of which the left A′, is mortised into the right and fastened thereto by a pin *a*, a foot or two in front of the end. The rear end of the right arm rests between two arcs of circles B B, connected with and being part of the frame, and to which it is fastened by a pin *b*, which passes through both arcs and through a hole mortised in the rear end of the arm, and which holds it steady in place.

In the extreme rear end of the right arm is a steel-spring C, which passes through and is securely fastened to a cap, which is held firmly in place by being mortised into the arc of the circles on either side. The object of this spring is to give play to the arm and to prevent injuries from the

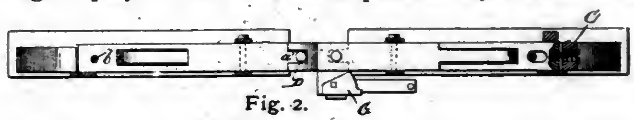


Fig. 2.

CUNEO'S CAR-COUPLING.

cars when coupling or uncoupling. The front has two jaws, and just in the rear of the jaws a pin D, through the two arms, which is caught in the teeth of the coupler and held steady in place. Just in the rear of the pin is a steel-spring E, which holds the two arms or jaws together and position.

F indicates the lever or windlass by which the cars are unlocked or uncoupled. This shaft is journaled in the arm A, and in a bearing-support A^2, supported by the arm, and just below the jaw of the arm A, the shaft is provided with a cam or wedge-block G, arranged to operate close to the jaw of the arm A, and to detach therefrom a similar jaw, which has been engaged therewith, as shown in proper in Fig. 1.

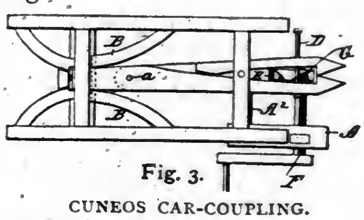


Fig. 3.

CUNEOS CAR-COUPLING.

It will be noticed that the inner faces of the ends of the arms are shouldered, while their outer faces are unshouldered, so that when the engaged jaws are forced apart the uncoupling is completed and there is no danger of another set of shoulders engaging.

It will also be seen that the uncoupling is positive, the parts being detached and forced out of engagement. The forward ends of the arms are slotted at *a′*, for a double

purpose. In the first place they are thereby adapted to couple with a car using the common link-coupling, while at the same time this slot, fitting over the pin D, prevents the jaws when coupled from becoming detached by independent vertical play.

The inventor claims for this device simplicity, durability and efficiency in coupling.

Toole's Railway Semaphore and Telegraph Operator's Train-Order Signal.

JAMES N. TOOLE, of Jackson, Mich., is the inventor of improvements in railway-signals, which are herewith illustrated and described. The object of the inventor is to provide signals that can be relied upon in all kinds of weather and at all times, and also to reduce the cost of such devices to the lowest figure.

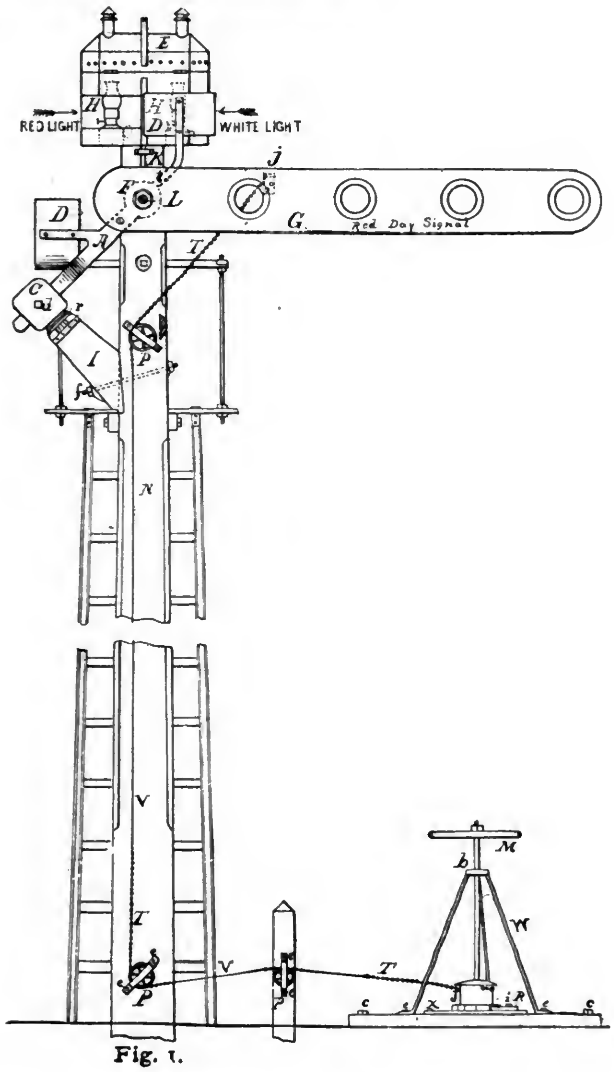


Fig. 1.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

In the accompanying cuts, Figs. 1, 2 and 3 refer to the semaphore, and Fig. 4 to the telegraph operator's train-order signal.

Fig. 1 is a vertical view of the long-distance semaphore ready for operation. The device is mounted on a pole N, which can be any height desired, and is operated by turning the brake-wheel M, which turns the drum J, and causes the rocking-shaft L, to turn in the box F, and the counter-balance weight C, to rise to an angle of forty-five degrees. This turns the screens D D, over one-fourth and covers the exposed (or danger-signal) light H, and discloses the other light which gives the signal "all right" in the night. By this movement the target-board G, is pulled down, from horizontal (or danger-signal) to a perpendicular position, which gives the signal "all right" in the day.

Fig. 2.

Fig. 3.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

The device can be set for danger-signal instantly by kicking off the ratchet-dog R, which lets the weight C, descend to the weight-stop I. This weight-stop I, is provided with a rubber-spring *r*, which works perfectly, as it weakens the force of the blow when the weight C, comes in contact with the stop I, and prevents all bad effects that would be likely to occur from the jar of the weight C. Small chains T T, are used over the pulleys P, when it is necessary to turn angles. No. 8 wire V, is used to connect the device at the ring *j*, with the ratchet-drum J. The wire V, can be one mile in length, more or less, and can be run over high posts when it is necessary to cross highways or railway-tracks.

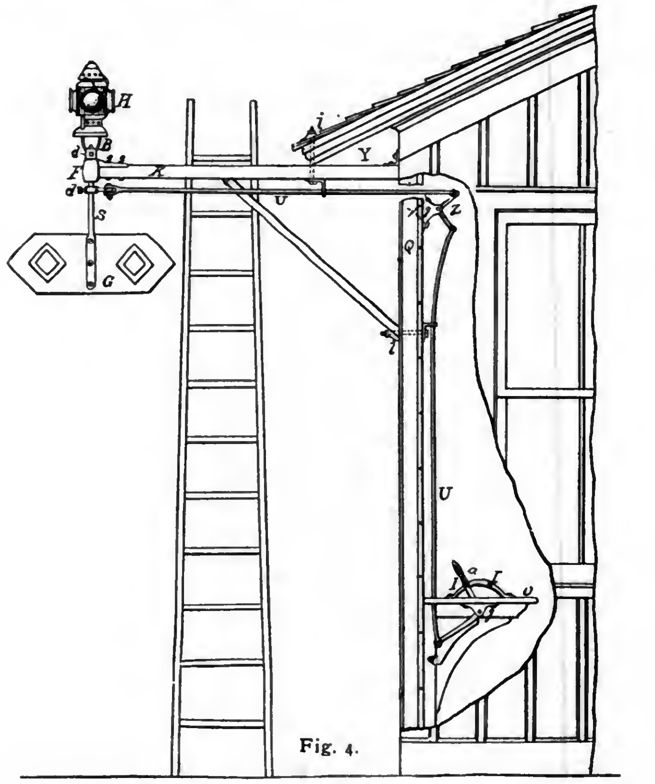


Fig. 4.

TOOLE'S RAILWAY SEMAPHORE AND TELEGRAPH OPERATOR'S TRAIN-ORDER SIGNAL.

The inventor believes that kerosene oil can be used with better results when the ordinary glass-lamp chimney is used, and for this reason he has provided the lamp-case E, in which he uses two common tin hand-lamps H H. The lamp-case E, is made of tin, and the glass that surrounds the lights slides in grooves on the inside. This glass can be of any color desired, and is arranged so

that it can be changed or replaced in a moment's time. The lamp-case E, can be reached with ease from the platform at the top of the ladder, and it lifts off the pole N, as shown at K. The whole case E, weighs about ten pounds and can be conveniently taken into the station-house to trim the lamps and put them in order.

Fig. 2 is an end view of the lamp-case, and Fig. 3 an end view of the screen. The lamp-case E, is very narrow, which brings the light close to the glass at front and back, making the light visible from all directions except a small space directly toward the screened light and at right angles to the track. This lamp has been tested during the fiercest storms, and gives entire satisfaction.

The inventor claims for this device simplicity, strength, durability and economy.

Fig. 4 is a vertical view of the telegraph operator's train-order signal. The fore-arm K, is firmly secured to the telegraph office, as shown at Y. To the end of the fore-arm is attached the circular-box F. and the fork B, is secured on the top of the shaft by the set-screw *d*. The signal is connected with the operator's table O, and the lever *a*, by the rods U U, and the angle-irons Z. To operate the signal the lever *a*, is pulled back to the hole I, in the circle on the table O, and by this movement the shaft S, is turned one-fourth around and the signal "all right" is shown. The lever *a*, is provided with a spring bolt-lock that catches in the holes I I. The holes in the circle are the stops for the device, and the lock being always in either hole the signal must show either "danger" or "all right."

The inventor claims this device to be simple, inexpensive and efficient.

Long's Lubricator.

JOHN M. W. LONG, of Hamilton, O., is the inventor of an improved lubricator, which is herewith illustrated and described. The invention has reference to that class of lubricators in which the lubricating material is contained within a cylindrical cup and pressed upon by a spring-loaded piston fitted to be adjusted by means of a screw.

In the accompanying cuts, Fig. 1 is an elevation, and Fig. 2 a vertical section of a lubricator constructed according to the invention.

A is a cylindrically-bored cup provided with a shank adapted to be threaded, so as to be inserted into an engine crank-strap, journal-cap, and all kinds of bearing to be lubricated; B is a removable cap attached to the top of the cup, as by being screwed thereon; C is a hollow boss formed upon and projecting from the top of the cup and arranged in the line of the axis of the bore of the cup; D is a piston, fitting within the bore of the cup and having an axial hole threaded for a stem; E is a threaded stem screwed through the piston and continuing upward through and out of the top of the boss of the cap; F is a handle-like head secured to the upper end of the stem; G is a pair of lock-nuts forming an adjustable upwardly-facing shoulder upon the stem; and H is a helical spring surrounding the stem above the lock-nuts, against which its lower end presses, and abutting with its upper end against an internal shoulder at the top of the boss of the cap.

The piston is to be provided with packing, and should so fit the bore of the cup as to prevent the passage by it of the lubricating material below it, and it should be at liberty to reciprocate nicely within the bore of the cup. The stem and piston are capable of a free vertical motion, the stem sliding freely through the top of the boss of the cap, the tendency of the spring being to press the stem downward as far as the head of the stem will permit. The lock-nut may be adjusted upon the stem so as to alter the compression of the spring. If the stem be turned by revolving its head with the fingers, the piston may be adjusted upward or downward upon the stem, the friction of the piston against the walls of the cup being sufficient to prevent the piston from revolving with the stem.

In operation, the cup is unscrewed and removed, carrying with it the stem and piston. The cup is then filled as full as desired with tallow or other lubricating material. The piston is then screwed upward upon the stem as far

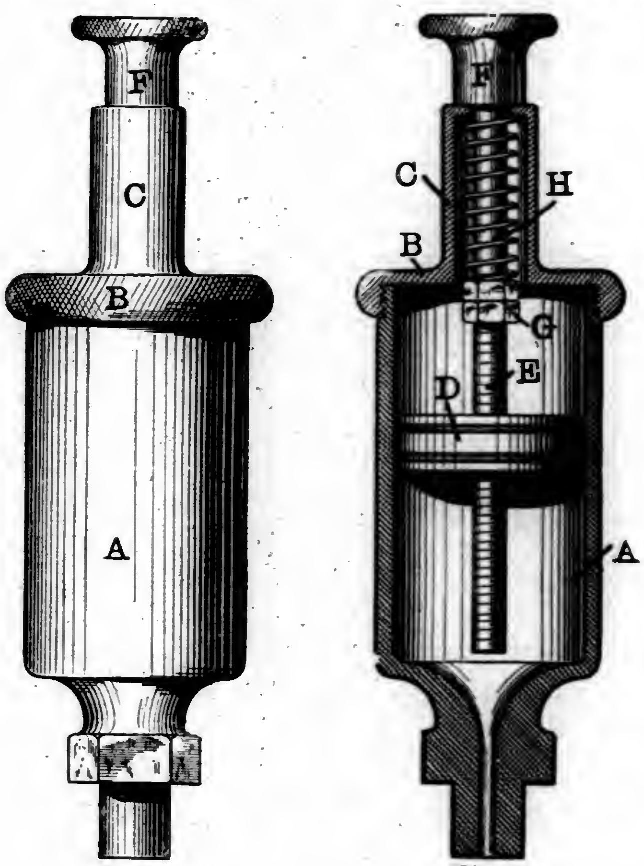


Fig. 1. Fig. 2.

LONG'S LUBRICATOR.

as the lock-nuts will permit, after which the parts are put in place. The head of the stem is then revolved, thus causing the piston to move downwaɹd upon the stem. When the piston presses upon the lubricating material, it will not freely move downward any further, and consequently the continued screwing of the stem serves to elevate the stem and compress the spring. In this condition the head of the stem will stand above the boss of the cap, and the piston will be pressed downward upon the lubricating material by the spring. This pressure of the spring serves to expel constantly the lubricating material from the cup, and when the piston is moved downward so far as to exhaust the spring the stem may be screwed upward again, and again compress the spring. In this manner the piston may be moved downward upon the stem at each exhaustion of the spring, and the effect of the spring upon the piston may be at any time adjusted by manipulating the stem so as to compress the spring

more or less, and also while the engine or machinery is in motion, if desired, by holding the hand on one side or the other so the head of stem will strike and turn. The lock-nuts may be adjusted to alter the normal compression of the spring.

It it claimed by the inventor that his device furnishes a simple and effective lubricator, and one that is not liable to derangement.

Anders' Cable-Grip.

DAVID B. ANDERS, of Philadelphia, Pa., is the inventor of an improved cable-grip, which is herewith illustrated and described. The object of the invention is to provide a new and improved cable-grip for cars for the purpose of gripping the cable of cable roads, and which grip can easily be raised out of the way when necessary.

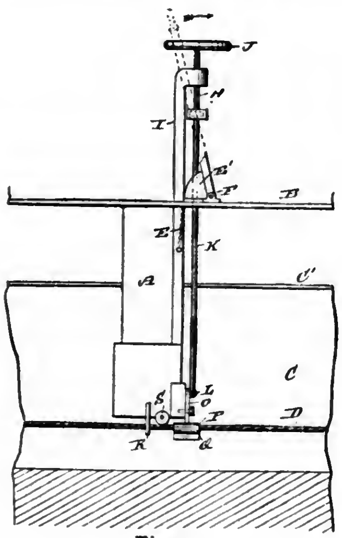


Fig. 1.

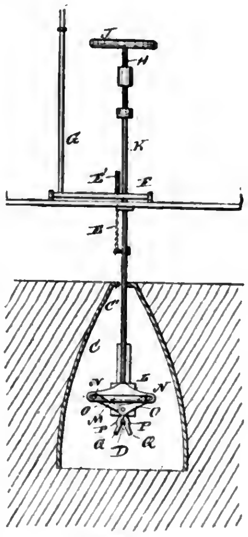


Fig. 2.

ANDERS' CABLE-GRIP.

In the accompanying cuts, Fig. 1 is a side view of the improved cable-grip; Fig. 2 a front view of the same, and Fig. 3 a detail view.

A flat bar A, projects downward from the car-floor B, through the top slot C′, of the tunnel or trough C, in which the cable D, runs. This bar A, is connected by a chain E, or otherwise, with a groove-edged quadrant E′, on a shaft F, journaled on the car-floor and having an upwardly-projecting lever G. An arm I, projects upward from the bar A, and through a nut on the end of the arm I, a screw H, passes, having a hand-wheel J, on its upper

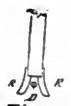


Fig. 3.

ANDERS' CABLE-GRIP.

end, and having its lower end swiveled in the upper end of a rod K, guided in the car-floor and passing downward in front of the edge of the bar A. On the lower end of the rod K, a cross-piece L, is secured, having a slot M, into which pins N, pass, projecting from the upper end parts of two gripping-levers O, which are pivoted to the edge of the bar A, at the bottom, and have gripping-jaws P, below the pivot, from which jaws lugs Q, project downward and from each other. Guide-lugs R, project downward and outward from the lower end of the bar A, and an anti-friction roller S, is journaled on the bottom edge of the bar A, to prevent the lower edge of the bar from sliding on the cable, thus greatly reducing friction.

The operation of the device is as follows: To grip the cable, the screw H, is turned to move the rod K, upward, whereby the jaws P, are pressed firmly against the cable. To release the cable, the rod K, is moved downward. The lugs Q, guide the cable D, in between the jaws P. When the car arrives at a cable-crossing the cable D, is released and the lever G, swung down in the direction of the arrow *a′*, whereby the bar A, is raised by the chain E. When the bar A, is lowered, the lugs R, guide the cable to the lower edge of the bar. Instead of providing the piece L, with the slot M, it may be grooved for receiving the pins N, on the upper ends of the lever O.

The grip is claimed to operate rapidly and grip the cable firmly.

Meigs' Car-Coupling.

CARLOS D. MEIGS, of Ausable Forks, N. Y., is the inventor of an improved automatic car-coupling, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a perspective view of the coupling; Fig. 2 a plan view of the coupling-link; Fig. 3 a sectional view thereof taken on line x x of Fig. 2, and Fig. 4 a detail view in perspective of one of the link-sections.

A B represent the draw-heads upon the ends of the cars, these draw-heads consisting of the face-plates *a*, and bars *b c*, to the outer ends of which the plates are con-

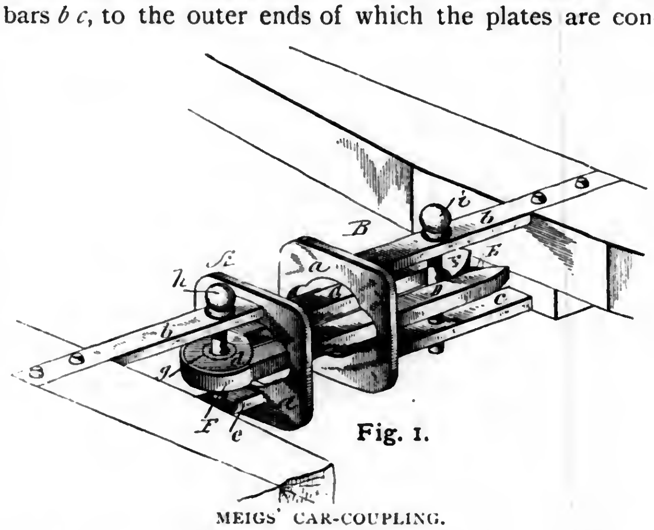


Fig. 1.

MEIGS' CAR-COUPLING.

nected. These skeleton draw-heads form a light and durable substitute for the ordinary draw-heads, but any form of draw-head may be used in connection with this improved coupling-link. This coupling-link consists of two sections or arms C D, each formed with an eye-plate *d*, and segmental shouldered guide *e*. The opposite ends of the link sections or arms C D, terminate in hooks E, of less thickness than the sections or arms, so as to form shoulders *l*, to act as stops for the hooks E, when brought together and upon each other, thereby holding the arms of the link parallel to each other and preventing them from closing too far by the action of the spring. The hooks E, have inclined edges *f*, to form cams to facilitate opening the link when the hooked ends strike the pin in the opposing draw-head. The eye-plates *d*, are pivotally connected together by a short tubular rivet *g*, extending

through the holes in the eye-plates and afterward upsetting each end of the rivet, as more clearly shown in Fig. 3. A flat spring F, is secured at one end to the outer edge of the link-section or arm C, some distance beyond its pivotal point, the spring being curved to embrace the edge of the eye-plates *d*. The opposite end of the spring F, is unattached and perfectly free to move, a shoulder *k*, being formed on the link-section or arm D, against which the free end of the spring abuts when the sections or arms are opened. The pins *h i*, may be of any of the usual forms, and the pin *i*, may have a chain or rope connected to it and extending to the side or top of the car for convenience of withdrawing it in uncoupling the cars.

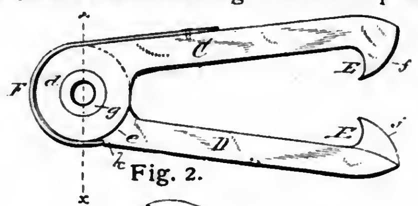


Fig. 2.

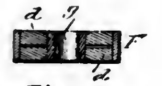


Fig. 3.

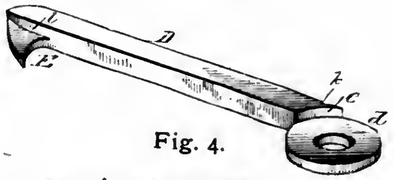


Fig. 4.

MEIGS' CAR-COUPLING.

The spring F, as heretofore described, is attached to the arms at one end only, the opposite end being free to yield when the link is opened. Thus the full action of the spring is obtained, with no liability of its snapping or breaking, as would be the case were both ends secured.

The inventor claims for his device, simplicity, economy and readiness of adjustment. No structural change is required in the draw-head, and cars employing the coupling can be coupled to those using the old link-and-pin coupling. The device is comprised entirely in the link which can be manufactured at short notice and at small expense. The device has already been subjected to a very satisfactory experimental test.

Bowman's Car-Strap.

EDMUND Q. BOWMAN, of Philadelphia, Pa., is the inventor of an improved car-strap, which is herewith illustrated and described. The general nature of the invention is an extensible car-strap or hold for passengers, principally in street-cars; and its object is to provide such an article that normally hangs suspended at a certain height from the usual rod or other point of support secured on each side of and below the top of the car, but which may be drawn down, against the stress of a suitable spring, so as to serve as a convenient hold for persons of comparatively short stature.

In the accompanying cuts, Fig. 1 is a side elevation showing the strap as extended, and Fig. 2 a longitudinal section through the middle of Fig. 1, with the cord or strap in its normal or retracted position.

A is a handle, preferably of wood, of any desired contour, that shown in the drawing being thought most suitable, as being a convenient form to be grasped by the hand. In this handle a longitudinal hole B, is made, leaving an offset *o*, near the lower end to constitute a support for the end of an open spiral-spring S, which is introduced into the recess. A cord or strap C, is passed within the spring, and attached in any convenient manner to the upper end of the cord is a head or button *d*, that bears upon the upper end of the spring. A neat and simple mode of securing the button to the cord is by means of one or more pins *p*, driven through a hole or holes in the side of the button into the cord. To the lower end of the cord C, is fastened in a like manner—that is, by a pin *p*—a transverse or other convenient handle E, adapted to be grasped by the hand. The vertical handle A, may be suspended from the usual rods or supports *f*, which are secured to the upper sides of the car by means of a buckle-strap *g*, or otherwise. Normally, the handle E, is held up against the part A, by the stress of the spring S; but when the former is grasped by the passenger and drawn down it will be practically extended. In fact, the cord itself, if made long enough to project a

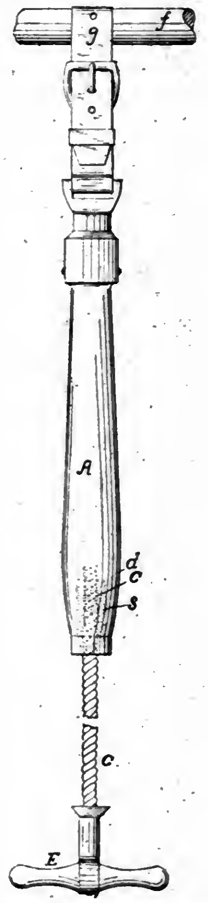


Fig. 1.

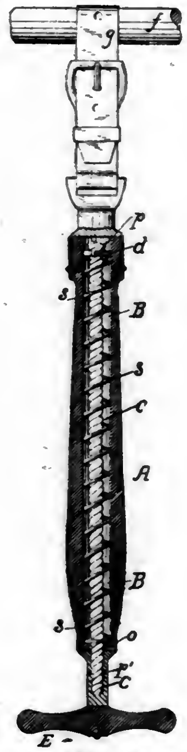


Fig. 2.

BOWMAN'S CAR-STRAP.

sufficient distance below the part A, will serve as a hold in lieu of the handle. The advantage of having an extensible car-strap is that when not in actual use it remains at such a height above the floor or seats of the car that it will not interfere with the movements of the occupants of the car, yet it may be reached by persons of short stature, and drawn down to a convenient height, the part A, serving also as a hold for tall persons.

It is claimed by the inventor that the use of this device does away with the soiled and unsightly car-straps in ordinary use, and that great additional advantage is secured in the fact that persons of different heights can hold the improved strap with comfort. The inventor is manufacturing the strap and having them made of hard wood, ebonized, with nickel-plated trimmings, in which form they will be ornamental to the car.

Davies' System of Railway Rail-Fastening.

GEN. THOMAS A. DAVIES, of New York City, is the inventor of an improved system of railway rail-fastening, which is herewith illustrated and described. The system consists of a new fish-plate and fulcrum spring or its equivalent spring-washer making, as claimed, a permanent elastic joint; two new forms of spikes to be driven at an angle into the tie; a stay-plate driven back of the spike across the grain of the wood, and a center fastening for the rail and metallic friction-plates to prevent the rail from cutting the tie. The device is protected by eight patents, and its various parts will be described separately.

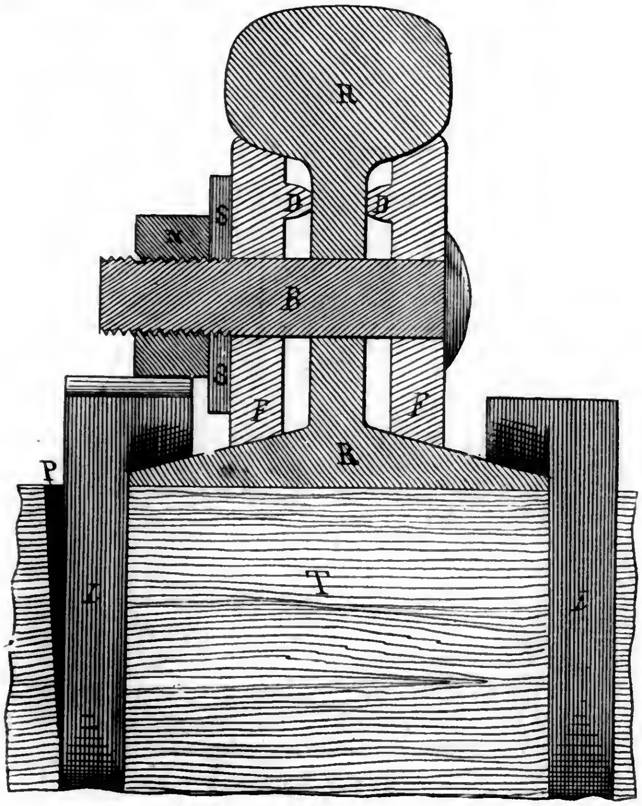


Fig. 1.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

Fig. 1 represents the three-bearing fish-plates; F F represents the cross-section of a pair of these fish-plates. They are the strap fish-plates with the usual holes for bolts, with a rib drawn upon the upper inside face to insure a firm bearing on each side of the web of the rails, and also a bearing upon the upper and lower bevels of the rails. These plates are to be drawn out to fit in this manner any sized rail. The plates with their bearings are kept continually in their places by the ordinary nuts and bolts acting upon powerful fulcrum-springs, or metallic spring-washers, as will hereafter be described. It is claimed that there will be no wear to these plates if the bearings are kept up continually, because there is nothing that can give, and hence no wear. It is the keeping up of these bearings that is the essence of the device and makes the joint perpetual.

Fig. 2 relates to the powerful fulcrum-spring. This spring is represented in full size and shape, and it is made of the best spring steel tempered $\frac{3}{16}$ inch thick, $2\frac{1}{4}$ inches wide and $1\frac{1}{2}$ inches longer than the distance between the centers of the bolts over which it operates by means of slots in the ends of the spring. The two arms of the spring from the center are made straight. The spring has a recoil to each end of $\frac{3}{8}$ inch and, as near as experiment could prove, has a recoil power equal to one ton weight on account of its shortness.

To make the joint, the fish-plates are set in at the top and then their bottom slid on the lower bevel until the three bearings are attained. The bolts are then inserted in the usual way, and the springs are put over the bolts, the bolts protuding through the slots in the springs with the angles of the springs resting against the fish-plate. The nuts are then screwed on and this is continued until the ends of the springs touch the fish-plates. The bolts and fish-plates are then smartly hammered up to their bearings and if the ends of the springs are then away from the fish-plates, the nuts are screwed up again until the ends of the springs just touch the plate. A center punch is then taken and the point placed on the angle between the nut and the screw. It is given two or three raps of a hammer on the punch which will destroy the continuity of the thread of the screw but will not injure the screw. If the nut is required to be taken off, a wrench applied to the nut will recut the thread and the screw be as good as new. The joint is then complete, In Fig. 1, F F are the

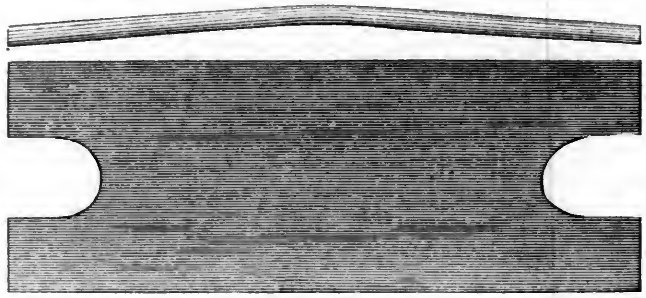


Fig. 2.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

fish-plates, S the springs, B the bolts, N the nuts, R the rail, and T the tie. It is claimed that there will be about two tons pressure on both plates to keep them to their bearings; while the bolts will never break unless they are defective, for they are held by the elastic springs which will give and take to any contraction or expansion or any sudden force. It is also claimed that these plates, springs and bolts, from experiments made, will never wear and will remain as they are put during the life of the rail. If, however, some wear does take place between the rail and the fish-plates, the springs will take it up and the bearings will still be continued and maintained.

The inventor gives the following result of an experimental test of these joints and his deductions therefrom:

"These joints have been in use in the Grand Union Depot and New York Central yard for eighteen months where the wear is estimated to be equal to twelve times the wear on the main line outside. So that they have had a wear equal to eighteen years on the main line of the New York Central, a road doing an immense traffic second to none in the country. The joints have never been touched or repaired, nor a nut tightened, nor a bolt broken, and they are as rigid and strong and perfect today as they were the day they were made, while every other joint in the yard, made with the most approved forms of fish-plates, has undergone repairs from broken bolts, or has been tightened by screwing up the nuts time and again.

"The joint has, therefore. well earned its name of the perpetual elastic joint which makes the continuous rail long sought for, but never before attained. This insures pleasant riding and will do away with the "click-a-ti-click" so annoying to travelers, resulting from imperfect and yielding joints. To the railway investor the imperfect joint is the thief of his profits, while a perfect joint and rigidly held rail to the ties reduces all wear of track and rolling-stock to the minimum."

Another peculiarity of the device is the oblique-headed spike. To all observers it is well known that however good a bearing against the rail the common railway spike may have when it is first driven perpendicularly into the tie, it takes but a few trains over the road to draw the

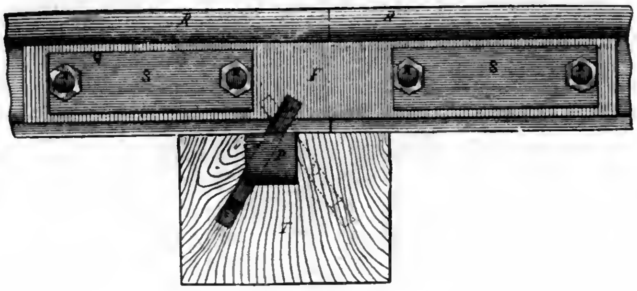


Fig. 3.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

spikes upward slightly, and the surging of the engines and cars sideways will slightly crush the wood fibre of the tie behind the spikes sufficient to leave the rail free from the spikes. The oblique-headed spike, here shown, has the same body as the common spike and the head is the same. It is made, however, with the head inclined to the body (see L, in Fig. 4), and when driven at an angle of about forty degrees from a perpendicular, the head will have the same bearing on the flange of the rail as the straight spike. This spike, it is claimed, can never be drawn from its place by any upward motion of the rail and is strong enough to hold the tie to the rail under any circumstances.

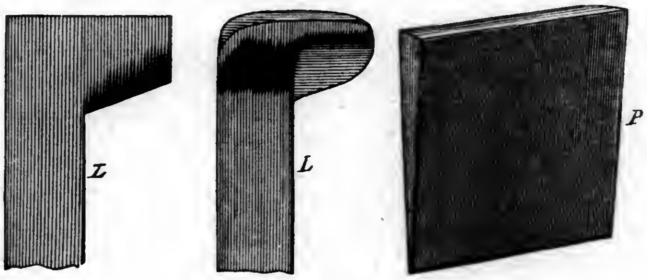


Fig. 4.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

The inventor gives the following as the defects of the old system of rail-fastenings and the benefits of the new, as substantially set forth in the patent specifications:

"The spikes may remain in place, but the rail is free to move within the end fastenings of the rail, and also to the right and left; all of which motions are at first small but sufficient to do great mischief to the tie, and sometimes to the spike, resulting in the spreading apart of the rails, when damage and accidents ensue. These are not common on well-constructed roads, but on any road, if the spikes are loose on the inside of the rail, the rail may roll and produce the same results. In this view the spike is a very important factor in railroading and important to be so made and driven that it cannot be drawn by any upward motion of the rail, or the fibres of the wood tie be crushed behind the spike. As soon as the spikes become even slightly loosened the rail, as before stated, can move slightly on the wood of the tie in any direction, and the sand getting in between the tie and the rail will perform the same duty in cutting away the tie that the saw does in cutting stone when fed with sand and water. Comparatively few ties last until decay ends their usefulness—they are mostly cut out and destroyed by the ever-running rail-saw. The oblique-headed spike driven into the tie at an angle from a perpendicular of forty degrees will effectually prevent the rail from ever drawing the spike by any upward motion of the rail.

"This, however, is meeting but one phase of the trouble. The most important point is to keep the rail from moving endwise or laterally and then get such a bearing on the tie that it will not cut, and then every difficulty is solved. The rail will then be held in place so that it can do no damage and is safe in these respects against injury or accident. In order that the spike shall not cripple the

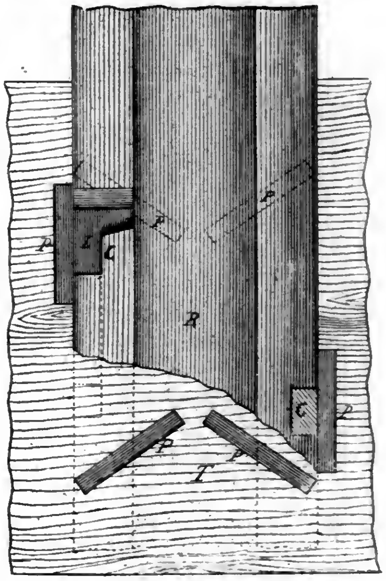


Fig. 5.

DAVIES' SYSTEM OF RAILWAY RAIL-FASTENING.

wood fibre of the tie, a spike stay-plate has been invented; this will prevent the side motion of the rail. To prevent the end motion the center fastening of the rail is used. To prevent the cutting of the tie by the rail, friction-plates driven into the tie under the rail are used."

L L, in Fig 4, refer to the conical and square-head spike. This form of spike differs from the oblique-head spike in that it can be used to be driven perpendicular into the tie or at any assumed angle right or left, and still have a complete yet the same bearing upon the incline of the lower level of the rail. The lower or contact surface of the head is made in the shape of the frustum of a cone which will fit the surface of the lower bevel of the rail no matter at what angle it may be driven into the tie. It is claimed that it is stronger in the head for the same amount of metal used than any other form of spike made with a head to be drawn out by a spike crow-bar.

The spike stay-plate is an iron wedge about two inches square, one-quarter inch at the top and sharp at the bot-

tom, and is represented in Fig. 1 back of the spike driven into the tie. It is also represented at P, in Fig. 3; in Fig. 5, and in full at P, in Fig. 4.

This plate is first driven into the tie the width of the body of the spike from the rail across the grain of the wood; then the spike is driven at an angle of about forty degrees from a perpendicular between the rail and the plate. These plates are intended to be used on the outside of straight tracks, one to each second tie, also on the outside of gentle curves one to each tie, and on sharp curves two spikes and two stay-plates to each tie. These stay-plates reinforce the fibre of the wood so that no movement of the rail, it is claimed, can take place outward.

Fig. 5 represents the center fastening. The rail-clips are made in the rail at *c c*, the depth of the width of the body of the spike, not opposite each other but to the right and left of the center of the ties. The stay-plates are then driven into the tie snug to the rail and opposite the clips, and left to project one-quarter inch above the ties. The clips are three-quarters of an inch long and one-half inch deep. The two spikes, either oblique-headed or conical-headed, are started into each clip and both spikes driven at the same time at such an angle that the spikes will bind on the sides of the clips and the stay-plates when driven home to their places.

The inventor gives the following as substantially set forth in the patent specifications:

"There is an objection to clipping the flanges of the steel-rail and, *per se*, that objection is sound where nothing is to be gained by doing so. But if there is a valuable object to be gained, and the gain is worth more than any risk of danger, it is equally sound to do it. But if it is seen that the clip which weakens the rail in fact, though practicably does not injure its utility, is made up by reinforcing its strength at the clip, then the objection falls to the ground. This arrangement of spikes and stay-plates with the solid bearing on the tie and friction-plates in the tie, reinforces the strength of the rail, and the rail thus reinforced is absolutely stronger at this point than at any point not reinforced."

The friction-plates in the tie are simply the inexpensive stay-plates driven into the tie diagonally across its grain and level with the top of the tie, as represented in Fig. 5, where the rail is broken to expose them. The rail will then have a full bearing on the wood and on the top of the stay-plates and, it is claimed, the stay-plates will prevent any wearing of the wood of the ties.

By these devices, it is claimed, the rail will be held firmly to its place on the ties; that the rail acting as a saw will no longer do its mischief; that the perpetual elastic joint will give the continuous smooth rail, and that the new system of fastenings will save expense in wear and tear of track and rolling-stock equal to a small dividend on the stock of any road as against the expense of repairs of the present old system. It is also claimed that the cost of new work under the new system, including a small royalty to the patentee, will not exceed the corresponding cost under the old system. The present old system can be altered to the new by a small expense compared with the benefits to be derived therefrom.

Further information concerning the system can be obtained from Eliphalet Wood, manager of the Walter A. Wood Mowing and Reaping Machine Company, 191 Fulton street, New York City.

Sprague's Railway-Station Signal.

ARTHUR A. SPRAGUE, of San Rafael, Cal., has recently invented an improved signal for railway-stations, which is herewith illustrated and described. The device is designed to serve as a day and night signal, station-sign and light, and it consists of a case supported upon an arm which projects from the side of the station-building, or other convenient point, one end of the case being formed with opaque sides and the other end having transparent glasses in the sides, so that a light which is set within that end may be seen from both sides and the end. The opposite end contains a frame-work having colored glasses or lenses set therein, and this is operated by a mechanism connected with the interior of the office. In connection with this lamp, similarly-colored signal-boards or targets are employed, which are also connected with the same operating mechanism so that they will be moved in conjunction with the lenses. The colored lenses and colored boards when not in use are kept entirely out of sight.

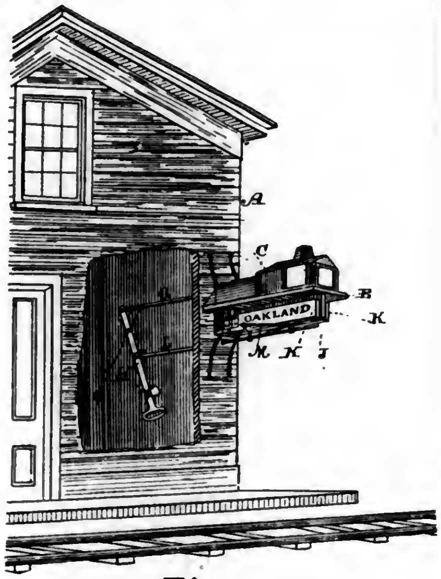


Fig. 1.

SPRAGUE'S RAILWAY-STATION SIGNAL.

In the accompanying cuts, Fig. 1 is a view of the apparatus, showing the signal in a position to allow the train to pass; Fig. 2 shows the apparatus in position to stop a train; Fig. 3 is an enlarged perspective view of the device, and Fig. 4 a plan of the same.

A is the side of the station-house, a post or other suitable structure from a projecting arm B, and may extend horizontally outward toward the track of the railway. Upon this arm is supported a case C. The outer end of this case has open sides with transparent glasses fixed in them, and a lamp D, may be placed in this portion of the case, so that its light can be seen along the line of the track from either direction, and it may also be seen from the end of the case, which is also glazed. The end may be in the form of a hinged door, which can be opened for the ready inspection and adjustment of the lamp within. The opposite end of the box or case C, has close opaque sides and ends, as shown.

Within the box, a frame-work E, is fitted to travel freely, so that it may be moved from end to end of the box. It is preferably mounted upon small wheels or rollers, so as to travel easily, and it has fixed in its sides

two colored glasses or lenses, so that when this traveling frame is moved forward it passes upon each side of the stationary lamp, and the lenses cover the white glass from the interior, so that the only light seen will be colored. This frame-work with its lenses is caused to travel back and forth within the lamp-case by means of a rod or arm G, which connects with the upper end of a lever H, fulcrumed to some convenient point within the station-building, preferably within reach of the station-agent or telegraph operator.

The lower end of the lever may have a disk or target attached to it, and the wall along which it moves has two circular knobs I, formed upon it, one being white and corresponding with the white glass in the lamp-box, and the other being colored to correspond with the movable lenses. When the lever is moved so that the disk upon its lower end stands against the white knob, it will show that the white light is exposed and the colored lenses concealed. When the lever is moved so that the disk stands against or over the colored knob, it will indicate that the colored lenses have been moved forward so that the colored light is thrown along the line of the track.

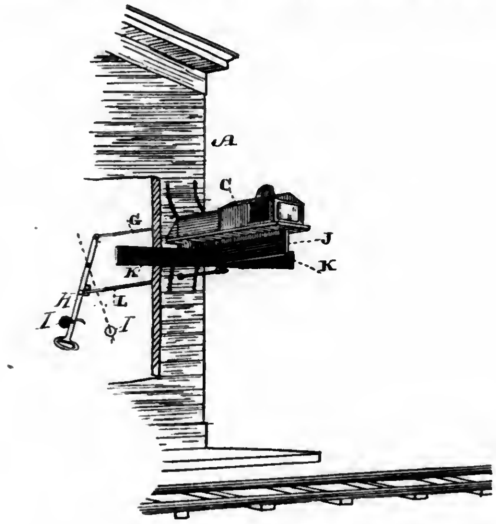


Fig. 2.

SPRAGUE'S RAILWAY-STATION SIGNAL.

In order to provide a corresponding daylight-signal, a board J, of sufficient width, projects below the arm which supports the lamp-case, and this board is painted the same color as the lenses. Upon each side of this board another board K, is hinged, so that they may be opened outwardly from it in each direction, and stand at right angles with it; or they may be closed together so as to cover it entirely. The outer faces of these hinged boards are painted white, and may have the station name upon them if desired. The inner faces are painted of the same color as the station-signal. In order to operate these hinged wings, a rod L, is connected with the lever H, inside the station-house below the fulcrum, and extends out horizontally beneath the colored signal-board, having suitable guides within which it moves so as to keep it in proper line. To this rod the inner side of two other rods M, are pivoted or hinged, while their outer or opposite ends are pivoted to the hinged wings or boards near their hinges. From this construction it will be seen that when the lever is moved so as to push the rod outward, the hinged wings will be closed against each side of the colored signal-board so as to cover and conceal it entirely, and when the rod is drawn back it operates through connecting-rods M, to swing the wings back until they stand at right angles with the signal-board or target. The movement of these wings is simultaneous and corresponding with that of the colored lenses in the lamp-case, so that when the lenses are projected forward to produce a colored light the wings will be swung outward so as to

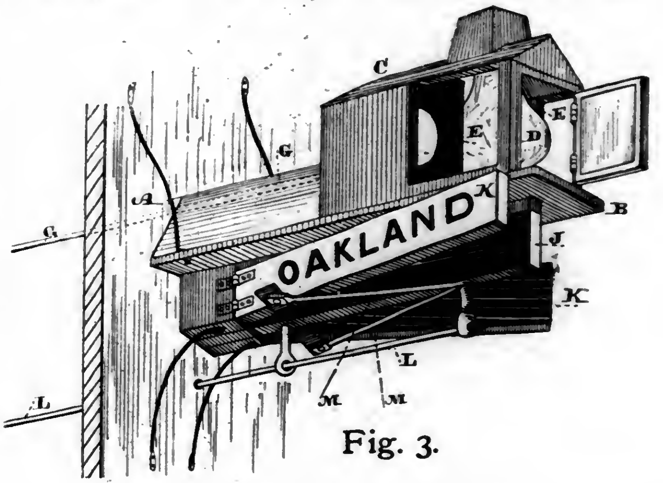


Fig. 3.

SPRAGUE'S RAILWAY-STATION SIGNAL.

expose the signal board or target, and when the lenses are withdrawn so as to expose the white light, the hinged wings will be closed upon the colored signal-board or target so as to entirely conceal it and leave their white outer sides exposed to correspond with the white light which will be exposed in the lamp-case.

By this construction the mechanism which is necessary for operating the station-signal is simplified, no gears, weights, or springs are necessary, and the operation of

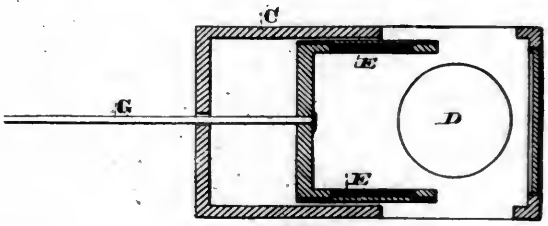


Fig. 4.

SPRAGUE'S RAILWAY-STATION SIGNAL.

the whole device is positive, while the exact position of the parts is indicated by the glasses at the lever by which they are operated within the office. In this device only one signal can be seen at one time, the other being entirely covered and concealed, and by moving the lenses inside of the lamp-case they will never be affected by snow or sleet so as to render them dim.

The signal is now in practical use on the North Pacific Coast Railroad, where it is giving satisfaction.

Riggin & Gummerson's Railway Gate.

CORNELIUS S. RIGGIN and ALBERT E. GUMMERSON, of Newark, N. J., are the inventors of an improved railway gate for grade-crossings, which is herewith illustrated and described. This invention consists in the combination, with the gate, of oscillating arms mounted upon shafts above the opposite ends of the gate, connections from the arms to the gate, pulleys connected with the arms to

actuate them simultaueously, crossed ropes applied to the pulleys to operate them in different directions, a hand-lever, and a connection from the hand-lever to the pulleys for oscillating the pulleys by the vibrations of the lever; and it also consists in a modification thereof, including counterbalance weights.

The accompanying cut is an elevation of the gate having the hand-lever connected with the vibrating arms and wheels by rods and cranks.

A is the gate, fitted to slide between posts B, and E are the lifting-arms secured upon shafts F, at the tops of the posts B. These arms are coupled to the gate by links G, and are secured to the shaft F, so as to turn with the pulleys G', the pulleys being so connected as to turn in opposite directions by means of crossed ropes H, which have their ends securely attached to the rims of the pulleys. The arms both point in toward the middle of the gate, and serve to raise the ends of the gate equally when either of the pulleys G', is rotated a sufficient distance, as one-third or one-fourth of a circle, depending upon the length of the arms E, and the rise required for the gate. A rise of sixteen feet or more, as required, can be given. The gate extends, as shown, through the posts and across the side-walks on either side, thus affording protection to pedestrians as well as to those in vehicles.

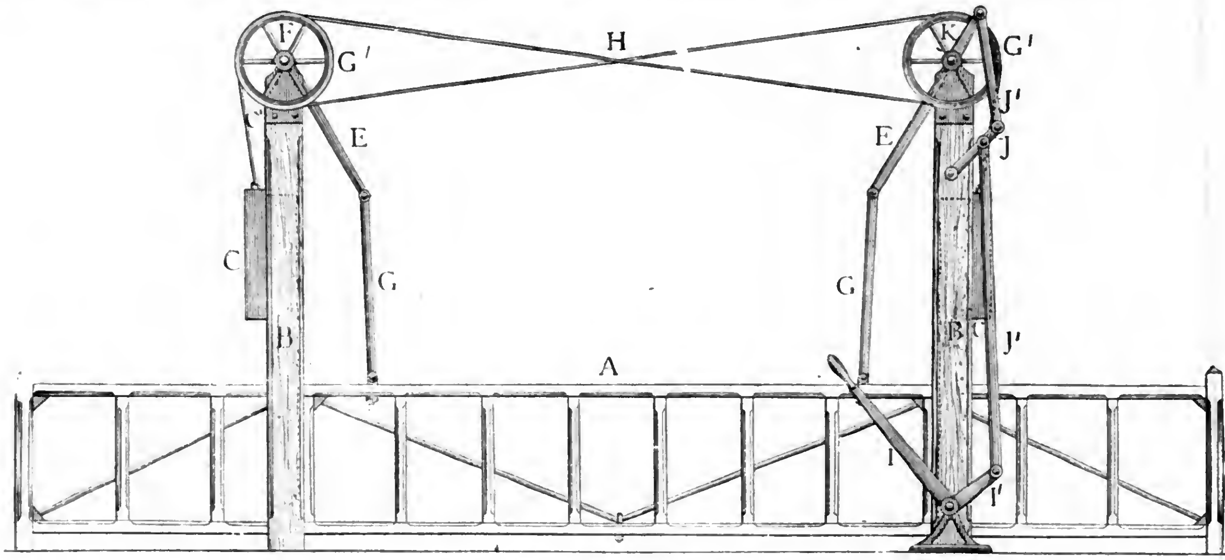
The gates are counterbalanced by weights C, which are hung to cords C', attached to the rims of the pulleys G', so as to be lowered or raised when the gate is raised or lowered by means of the pulleys G'. I is the hand-lever, I' a crank affixed thereto, and J a multiplying-lever above the lever I, upon the post B. J' are rods connecting the crank I' with the lever J, and with a crank K, affixed to the upper pulley, G', so that the vibration of the hand-lever produces the required oscillation of the pulley G', and arm E, by a single movement on the part of the operator. By the balancing of the gate and the connection of the lifting-arm with the hand-lever I, in the manner described, the desired movement in the gate is effected very rapidly and easily.

From the above it will be seen that the combination of the arms E, with the pulleys G', connected together by the cable or ropes H, so as to turn simultaneously, affords a means of raising the two ends of the gate by a partial rotation of the pulleys G', and thus enables the gate to be operated by a single movement of a hand-lever.

The posts B, are capped at the top to hold them securely together, these caps also serving as a box to hold the shaft. The posts may be made of either wood or iron, as desired. In the former case they would be 8 × 12 inches in size, and in the latter commensurably smaller. The gates may also be constructed of either wood or iron, but the former material is equally efficient and at the same time lighter and more inexpensive.

The gates are supplied with an alarm bell, operating automatically, and the entire mechanism of the gates is above ground, being thus absolutely free from obstruction by snow, ice and frost during the winter months.

The gates may also be operated with link-belting and sprocket-wheels or chain and ropes, with proper gearing in either case to be controlled by a crank.



RIGGIN & GUMMERSON'S RAILWAY-GATE.

The inventors claim that their device provides a simple, durable and inexpensive gate for grade-crossings, that in its use perfect protection is assured to life and property, and that, being counterbalanced by weights, the gate can be raised and lowered with the slightest exertion on the part of the operator.

On one of the Russian railways the practice has for some time been in vogue of heating the tires for the wheels by immersion in hot water, instead of by fire, before shrinking on the wheels. Near a boiler stands an iron vessel of water, which is heated to 100° centigrade with the steam; in this the tires are immersed for ten or fifteen minutes, then raised by a crane and brought on the body of the wheel. For this operation three workmen are required, and in eleven hours from twelve to fourteen tires are thus treated, and the difference of diameter is three-fourths mm. for every millimetre. It is said that this mode of heating insures, on the whole, a greater degree of regularity. According to observations made on the railway in question, 37 per cent. of the tires shrunk on by the old method came off, and 5 per cent. were broken in six years; while in the case of the water-heated tires the loosening showed less than 1 per cent. in three years, and with only one tire broken.

GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner,* so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most thoroughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like peope everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, President.

American Railroad Journal.

WHOLE No. 2,572.] NEW YORK, JANUARY, 1886. [VOLUME LIX.—No. 10.

ACCIDENTS FROM MISPLACED SWITCHES AND DRAW-BRIDGES.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN discussing the causes and means of prevention of railway accidents it should always be borne in mind that the old adage, "lightning never strikes twice in the same place," has frequently led to trouble. The idea is common among men that accidents are not liable to be repeated in kind; and if something serious has occurred they reason that in the common cause of events it is not likely to happen again, and no precautions are taken to prevent a recurrence. They follow the teaching of another foolish old saying, viz.: "It is of no use to lock the stable after the horse is stolen." So far as that particular horse is concerned a lock on that stable would be of no particular benefit; but other horses would be very likely to occupy the stable and a lock would be in order as a means of safety. The owner might reason from the same standpoint that some railway officials do—that it is only about once in a lifetime that a man has a horse stolen, and as he has already lost his there is no sense in his squandering money for a lock.

Some years ago a serious accident occurred on a New England road at a misplaced switch. Immediately thereafter the inventor of a safety-switch called on the superintendent full of the feeling that it is an ill wind that blows good to no one, and firm in the belief that the accident would result to his advantage. On his return to his headquarters he was met by his anxious partner, who had called on the superintendent and offered his wares previous to the disaster. "Well, what luck?" queried the part owner. "Would you believe it?" exclaimed the disappointed genius, "the old duffer said that such disasters did not occur very often, and it would doubtless be a long time before they would experience the like again. Indeed, he believed it would never happen again, for such accidents were rare." "So you didn't make a deal," remarked the part owner. "No. What did he say to you when you called on him?" "Well, he said they didn't need any safety-switch. They had had no serious run-offs at switches since he took charge of the road, and he had been there nearly a year. He employed none but reliable switchmen and trainmen, and he had no use for patent safety-switches."

The above was formerly a common experience with inventors of safety-switch and draw-bridge fixtures, but that style of reasoning is giving place to a belief that like causes will produce like effects *ad infinitum*, unless preventives are resorted to, and one disaster is no longer regarded as a guarantee of safety in the future. It is only a few months since the third of a series of draw-bridge disasters occured by which as many trains were destroyed at the same place and all within a few years. What action will be taken by the management of that road now, after three strokes of lightning in the same place, is not known, but it is very likely that some measures will be adopted to prevent further slaughter in that locality. At all events, the past experience of American railway officials points unmistakably to the fact that it is unsafe to monkey with fate, and that there is genuine economy in locking the stable even after a horse has been stolen; but it is better to avoid tempting the thief in the first place by leaving it open. But this sermonizing will be closed by saying that there are not a few who act on the belief that as they have never experienced an accident it is a tolerably sure thing that they are Fortune's favorites and need no precautions, or, having met with misfortunes, have suffered their allotted share of mishaps and are henceforth secure from harm.

Chief among the preventable causes of accidents is the misplaced switch, the causes of which are popularly supposed to rest wholly with employés. Much of American railway practice has placed an unlimited amount of responsibility on switchmen and train-hands as well as yardmen, and the wonder is not that there are so many switch accidents but that they are not more frequent.

Accidents from misplaced switches are of two classes. One causes derailment and the other does not, but some of the most terrible collisions on record have been caused by the latter. The former class can be entirely prevented by the use of some of the safety-switches now in successful operation on some of the best managed roads, but to prevent the latter opens a field for the exercise of some ingenuity. The safety-switch prevents derailment of trains moving in a direction that would cause them to go through the frog (or frogs, if at a three-throw switch) before reaching the head of the switch; that is, if coming out of a siding and the switch is set for the main track, or *vice versa*, the safety-switch would prevent derailments in either case, but it is obvious that a train moving in the opposite direction (running toward the point of the frog) must follow the lead of the switch-rails to whichever track they are set for and this leads to a collision. If a train takes a siding either to meet or pass another train, or to allow another train to pass, and the switch is not turned back to the main track, a collision occurs if a train is following. For this there is no preventive in general use other than the vigilance of switchmen and trainmen. Lights and semaphores, balls, etc., that are arranged to show the position of the switch by night or day, are only a partial protection. They are either misunderstood or the vision is obstructed by fogs, storms or darkness, or they are frequently passed unheeded, and when vision is wholly depended upon no amount of display of signals is reliable at any time as a means of safety. In most if not in all cases of the kind under consideration the responsibility

is too much divided, and, as is too frequently the case, the responsibility rests nowhere. In case of trouble the engineer asserts that he obeyed the signals but they were wrong; the swichman or bridge-tender state to the contrary; then the station-agent or some of his assistants, or the yardmen, the conductor of some other train, or some brakeman, or trackmen, or passer-by had been told or requested to set the switch or signal, and either forgot it or supposed someone else had done it or was going to, and the responsibility vanishes into thin air. Again, station-agents are held responsible for the shortcomings of trainmen who leave open switches behind and before them, and while they (the over-worked agents) are attending to one duty another is neglected, and every one is nominally accountable for his own acts or failure to act and the failure of others, and there is an air of uncertainty throughout the whole management. And it somehow happens that when the verdict at an inquest places the responsibility it usually rests on the oldest and most reliable man in the company's employ, and we have daily proof that the human machine is wholly untrustworthy and should not be burdened with excessive care and responsibility.

It is better to bring automatic machinery to the aid of brain and muscle than to incur the risk of a disastrous failure of the latter. When machinery is kept in perfect working order it performs its duty with unerring accuracy, and an automatic signal can be arranged that will effectually prevent collisions at misplaced switches. But this must be effected through audible signals worked automatically and connected with the switch. Either an explosive on the rail or an electric bell or gong in the cab would rouse an engineer out of a reverie and bring him to a realizing sense of his danger on the instant, whereas he might (as they frequently do) pass lights or targets unheeded. Torpedoes can be placed on the rail by connecting small cables with the switch and extending them to a safe distance, and intermediate signals may be placed at neccessary points. This, and electric signals, have been tested sufficiently to prove their reliability, and the former is so cheap as to be afforded by the poorest railway companies in the land, and they are the very ones which cannot afford to forego their use.

Some of the automatic signal apparatus is objectionable on account of being delicate and complicated in construction and liable to derangement; but these appliances are becoming more simple in construction, and, if properly cared for and kept in good order are more reliable than any human agent, and with these audible signals and safety-switches there are very few if any switch accidents, and the same will also apply to draw-bridges. Although accidents from open draws do not appear to be very frequent the record shows thirty-six for the past ten years, and doubtless the loss of property and hindrance to traffic arising from either disaster (not to mention the loss of life and limb) would have covered the expense of providing all the misplaced draws with safety appliances.

The number of serious derailments from misplaced switches in the United States during the nine years ending in 1883, is reportedby the Massachusetts commissioners at 685; the number for the latter year being 92, increased from 54 in 1877-78, and from 79 in each of the two years previous to 1883. There is no reliable account of the number of collisions from this cause, but they, like derailments, are on the increase in greater ratio than mileage or number of trains, which is discreditable to American railway management. Some officials may object to the use of safety appliances on the ground of derangement, but there are those that have a "tell-tale" attachment showing at a glance when they are out of order, and they should be investigated and tested by all progressive railway officials.

WHEN SHOULD A CAR GO TO THE PAINT-SHOP?

BY A MASTER CAR-BUILDER.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE railway manager frequently has to decide this question independently of the advice of the car-builder or car-painter, and too frequently trusts to luck for a correct answer. Commonly the car is made to run the regulation number of months before it is allowed to go in for painting. No distinction is made between those cars painted by the company and those finished at contract shops. All must stand a like amount of wear. The only exception is when a car begins to look particularly dingy and disreputable.

When traffic is brisk and rolling-stock scarce, a good excuse is found for prolonged service, and ignorance in regard to a few fundamental facts concerning painting frequently causes much loss to the company. Long and severe usage may, in some cases, do a car little or no harm. In other cases a short exposure may do great damage to a car and shorten its lifetime.

One of the most important uses of paint or varnish is to prevent moisture from reaching the vital portions of the car. If the wood be properly filled as a foundation, varnish alone will answer. Accepting as an axiom the proposition that wood when subjected to alternate wetting and drying decays with great rapidity, we reach the conclusion that the important function of varnish or paint is to exclude moisture from the frame, etc. It follows, therefore, that as long as dampness is kept out, the car is safe to run without danger of permanent injury. When this cannot be done and moisture begins to penetrate behind the panels, the car is liable to rapid decay.

In inspecting the painting and varnishing of a car for the purpose of deciding whether it must go to the shop, the general appearance may, in cases of emergency, almost always be neglected. The first points to be examined are the window-sills and their junctions with the panels and mouldings, and next the points where the battens touch the panels. If the varnish has cracked here and the paint has opened so that the continuity of the protecting surface is destroyed, order the car to the shop. If at those points paint and varnish are still continuous and keep out the water and beating of rain, the car may safely run, because the frame is protected.

In casing of pressing need of rolling-stock it is by no means necessary to put a car into the shop for entire repainting or even for revarnishing. The cracks can be stopped in a short time and the car made fit to stand a considerable length of service. It is often a matter of

economy not to paint a car even when the varnish is gone and the paint itself is getting in bad condition. A few days expended in making the cracks tight will frequently put a car in condition to run for months. The expense of this is small.

It sometimes happens that a car not six months from the shop shows these cracks while the varnish is still bright and the color unfaded. In such a case send it to the shop. Order it to be made tight. This can be done in a short time. New cars, from the shrinkage of the wood and a general settling down to their bearings, are especially liable to the cracking of the paint and varnish. When the car goes to the shop ample time will be given for "taking up slack," tightening of truss-rods, nuts, braces, etc. Neglect of these precautions is likely to result in a rapid deterioration of the frame. It will "work," and by its very motion grind itself out at certain vital points and, at the same time, from the entrance of moisture around the windows, will decay quickly.

A passenger-car frame when well made, if protected from the weather and its bolts, nuts and truss-rods looked after, will last in first-class condition for twenty years or more. Yet the strength of the same frame may be destroyed in five year if moisture finds access to it.

By a few inexpensive but very necessary repairs at the right time cars can be kept sound even when the panels appear to be laughing through paint whose original color cannot be distinguished. Such cars can usually be stripped inside and out, and at a small expense converted into neat and serviceable stock good for many years wear. Similar cars, if neglected, will be found too badly rotten in the frame to be worth new panels when only ten or eleven years old.

Bearing these facts in mind, rolling-stock in time of need may be subjected to long and severe usage with repairs occupying but little time and of insignificant expense.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,

SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the American Railroad Journal.]

Second Series.—The United States.

IV. THE DENVER AND RIO GRANDE RAILWAY.

The medical department of the Denver and Rio Grande Railway is presided over by a senior surgeon, residing at Denver, assisted by about forty local surgeons at various points along the lines. Fixed salaries are paid to all. Compensation by a fee-bill was at first tried with local surgeons but was found to work unsatisfactorily in a country so sparsely populated. They report monthly to the senior surgeon.

On April 1st, 1883, regulations were adopted creating a hospital fund by the deduction of 50 cents per month from the wages of all employés. They became accordingly entitled to medical attendance and medicines, or admission to the company hospitals, when sick from diseases contracted while in the company's service, or suffering from injuries received in line of duty. Those affected with trivial ailments are always treated as out-patients, and no one remains in hospital more than four months without consent of the senior surgeon or general manager of the road. Any man desiring treatment must bring from the superintendent or foreman a certificate addressed to the nearest company surgeon, stating the circumstances of his case, and the surgeon will then use his discretion whether to attend the case or forward him to hospital. The benefits of the fund are not granted to the subjects of venereal disease or of affections resulting from intemperance, vicious habits, or old diseases contracted prior to entering the service of the company; nor to those suffering from small-pox, inasmuch as free vaccination is offered to all. The senior surgeon has discretionary power to discharge from hospital and from the benefits of the fund those who would become a burden by reason of chronic disease, and those inmates who become intoxicated or otherwise disorderly.

The hospitals used by the company have been civil hospitals located at Denver, Pueblo, Salida and Durango in Colorado, and Salt Lake in Utah. A hospital has recently been built at Salida, partly from the hospital fund and partly from a contribution by the company. It is designed to erect another at Denver. After this it is intended to place the surplus funds at interest and apply the revenue to the relief of disabled employés, since a surplus of about $25,000 has accumulated in two years of prudent management.

I have before me a statement of receipts and disbursements of the hospital fund for the fiscal year ending March 31st, 1885. There was a balance on hand of $17,036.09 March 31st, 1884. The receipts during the year amounted to $28,236.35. The disbursements for the same time were $21,365.28. The number of sick and injured employés treated at the various hospitals was 476; as out-patients, 4,490. Average cost of patients in hospital, $17.85. Average cost of out-patients, $4.30.

It is also contemplated to create an insurance fund by monthly contributions of 50 cents from the wages of employés. This is to entitle them to an allowance of $25 per month for time actually lost from injuries received in line of duty, or $300 for loss of a foot or hand, $500 for total disablement, or $800 payable to their heirs in case of death. Employés of the company are to have the first privilege of borrowing from this fund, at 6 per cent interest on good security, for the purpose of securing homes. On adoption of this plan all classes of employés will be subjected to careful physical examination. At present the examination includes only men who run on trains, but it is unusually thorough for this country, having refence not only to integrity of the organs of sight and hearing, but also to those conditions of constitution and health which would disqualify one for acceptance by a life insurance company.

A peculiar feature of this company is the provision of a medicine chest to be in charge of the conductor of every train. This contains laudanum, ammonia mixture, styptic collodion, bicarbonate of soda, styptic cotton, needles with chamois, saddler's silk, wax, sponges, adhesive plaster, bandages, lint and scissors. Printed directions are added, illustrated with wood-cuts.

No provision is made for medical attendance of the families of employés. This is a desirable feature, and

might be carried out through the local surgeons, as indicated in the previous article.

The personal hygiene of employés and the sanitary condition of railway-carriages, buildings, grounds, etc., are "only partially" made subjects of medical attention.

The company has no regulations relative to transportation of live-stock, beyond what state laws require.

The information required for this article has been furnished by the chief surgeon, Dr. F. J. Bancroft, by whose zeal and executive ability the medical service of the Denver and Rio Grande Railway Company is rendered, in my judgment, the most efficient in the United States.

FAST PASSENGER-LOCOMOTIVES.

BY T. EVERETT AUSTIN.

[A Paper read before the Engineers' Club of Philadelphia.]

THE proper design for a locomotive that should be capable of developing a high speed (of say 60 miles an hour) under ordinary conditions of travel, and that should be both economical and powerful in practice is a problem that has engaged the attention of engineers and master mechanics of railroads from the time of the "Old Ironsides" until the present day. Some of the more recent efforts in this direction have been the Fontaine locomotive of glorious memory, and the "Baldwin Bicycle." Turning to those that are to-day doing good service, we might mention first, what the *American Machinist* of January 7th, 1882, calls the swiftest American locomotive, and from which issue the following description is taken:

"With the rapidly increasing passenger-traffic upon the railroads in this country has also come the necessity of increased speed, and to-day all the railroad companies controlling trunk lines are striving with each other to see which can make the best time with express-trains.

"The Master Mechanics' Association have a standing committee appointed to determine which is the best form of passenger-locomotive. The locomotive-builders are also exercising their brains actively in endeavoring to produce a locomotive that shall combine power, speed and economy, three essential requisites in accomplishing the service desired. * * * A locomotive lately built by the Baldwin Locomotive Works of Philadelphia, for the Central Railroad of New Jersey. * * * This locomotive is considered by its builders to be their best design. * * * Four locomotives * * two with 18 × 24-inch cylinders, and two with 19 × 24-inch cylinders are now running. * * In general appearance it * * resembles the usual style of first-class eight-wheel locomotives, but with some very important improvements. In order to supply steam to larger cylinders, a larger furnace, more heating surface and greater boiler capacity are required. In the ordinary passenger-locomotive the boiler sets inside the frame, and the necessary water-spaces at either side of the fire-box greatly reduce the width of it. These water-spaces are made as small as is considered safe, in order to get the necessary grate surface; to overcome one evil another is introduced, and since the introduction of anthracite coal as a fuel upon locomotives, a larger heating surface is required; at first only the best quality was used, but lately coal dust has been successfully burned to some extent. * * * Boilers have recently been placed upon the top of the frames which admits of their being made as wide or wider, if necessary, than the outside of the frames. This improvement admits of a wider fire-box and larger water-spaces, but the boilor sets higher, and the depth of the fire-box is very much reduced."

The following are some of the principal dimensions: Gauge of road, 4 feet, 8½ inches. Boiler material, Otis steel, ⅜ inch thick. Shell 52 inches diameter. Style, wagon-top. Fire-door, 16 inches diameter. Dome, 32 inches diameter. Fire-box, 125⅞ inches long × 43¾ inches wide. corrugated sides. Depth, front, 51¾ inches; back, 42½ inches. Crown sheet, ⅜ inch thick. Tube sheet, ½ inch thick. Sides ¼ inch, and back $\frac{5}{16}$ inch thick. Water-spaces, front, 4 inches. Sides and back 3 inches. Crown bars 5 inches × ¾ inch, placed 1½ inch above crown. Crown bar bolts ⅞ inch, screwed through sheets with nut below. Combustion-chamber 35 inches long. 200 tubes 2 inches diameter × 11 feet 5⅞ inches long, No. 12, wronght-iron ends, arranged for copper rings. F. B. end, wrought-iron dry-pipe, 8 inches diameter. Grate water tubes 2¼ inches diameter. Drain grate area 38 square feet. Heating surface in fire-box 145 square feet. In tubes 1,175 square feet. Total, 1,320 square feet. Steam pressure 140 pounds per square inch. Rigid wheel-base 7 feet 6 inches. Total wheel-base 21 feet 8 inches. Weight in working order 93,000 pounds. Cylinders 18 inches diameter × 24-inch stroke Driving-wheels 68 inches diameter. Driving-axle, Otis steel journals, 7½ inches diameter × 8½ inches long. Smoke-stack, straight 16¾ inches diameter × 14 feet 10 inches height above rail. Truck, four-wheel swing bolster, 32 inches diameter of wheels. Journals 5½ inches diameter × 8 inches long.

Class K, Pennsylvania Railroad locomotives, were designed to run in opposition to the engine just described; and while they give very good results for an ordinary eight-wheel American locomotive, do not, I understand, equal in performance and economy all that might be expected of them.

The general designs of these engines are probably so well known to the members of the club as not to require description. Some of the dimensions are: Gauge of road, 4 feet 9 inches. Cylinders 18 inches diameter × 24-inch stroke. Drivers 78 inches diameter. Driving-wheel journals 8 inches diameter × 10½ inches long. Total weight 92,700 pounds; on drivers 65,300 pounds. Wheel-base, rigid, 7 feet 9 inches. Total, 22 feet 7½ inches. Wagon-top boiler 50 inches diameter, 201 tubes 1⅞ inches diameter × 10 feet 10¼ inches long. Fire-box 9 feet 11⅞ inches long × 3 feet 5¾ inches wide. Grate surface 34.8 square feet. Heating surface in tubes 1,005 square feet. In fire-box 120 square feet. Total, 1,305 square feet. Engine-truck, four-wheel rigid bolster wheels, 33 inches diameter. Journals 4¾ inches diameter × 7½ inches long.

Turning next to the "Wooten" passenger-locomotive, designed for the same service, we find the dimensions of type D 33 to be: Boiler 53 inches diameter at smallest ring, tapering back to 58¾ inches at joint of fire-box.

Fire-box 8 feet 6 inches long × 8 feet wide inside. Combustion-chamber 31 inches long; 345 tubes 1½ inches diameter × 9 feet 2 inches long. Grate surface 68 square feet. Heating surface tubes 1,232 square feet, Fire-box 151 square feet. Combustion-chamber 32 square feet. Total, 1,415 square feet. Cylinders 18½ inches diameter × 22-inch stroke. Drivers 68 inches diameter. Rigid wheel-base 6 feet 5 inches. Total wheel-base 20 feet 5½ inches. Stack 18 inches diameter. Weight on drivers 60,780 pounds. Total weight 89,750 pounds.

The "G. F. Ward," for the New York, Providence and Boston, and the "Pegasus," for the Boston and Lowell Railroad, will illustrate the best practice of the high speed engines of the Rhode Island Locomotive Works. These two engines are nearly alike, the dimensions being: Track gauge, 4 feet 8½ inches. Cylinders 18 inches diameter × 24-inch stroke of piston. Boiler 52 inches diameter; 184 tubes, 2 inches diameter × 142¾ inches long. Fire-box 71¼ inches long × 34 inches wide. Drivers 72 inches diameter. Rigid wheel-base 102 inches. Total wheel-base 279 inches. Engine-truck, four-wheeled swing bolster wheels, 33 inches diameter. Weight on drivers 59,000 pounds. Total, 91,000 pounds.

The recently finished Mason passenger-locomotive for high speed, designed by the superintendent, John T. Meats, has attracted considerable notice in the eastern states. In these engines care has been taken to increase the size of all wearing parts, new cylinders and all other working parts being carefully gone over, and we may expect from these engines as good performances as are possible to be gotten out of the standard American type. The dimensions are: Cylinders 18 × 24 inches. Driving-wheels 68½ inches diameter. Rigid wheel-base 9 feet. Total wheel-base 23 feet 4 inches. Weight in working order 102,000 pounds. On drivers 68,000 pounds. Boiler, style wagon-top, 54 inches diameter. Material, steel, $\frac{7}{16}$ inch thick; 212 tubes 2 inches diameter × 11 feet 2 inches long. Fire-boxes 78 inches long × 35 inches wide, 75 inches high. Driving-axle journals 8 inches diameter × 8 inches long. Engine-truck, four-wheeled swing bolster wheels, 30 inches diameter. Journals 5½ inches diameter × 11 inches long.

After the foregoing description of what has been done in the way of fast passenger-locomotives of the standard American pattern, which are acknowledged by all as not filling the bill of what is required in these days of fast travel and heavy trains, the writer would beg to call your attention to the following design for a fast passenger-locomotive. I would state in the beginning that there is, to my best knowledge and belief, nothing in this design covered by a patent, and if it is of use to any one they are welcome to it. We do not claim anything absolutely original in this locomotive, all of the pieces for the most part being "old friends with new faces." Some of the peculiarities of this engine are, first, the twin fire-boxes. Boilers of this style were designed by Mr. E. D. Leavett, Jr., and built for the Boston sewerage engine, and are to-day giving first-class results. The only departure I have made from his design is in using the Belepare top, which makes a better arrangements of stays, and in the divided combustion-chamber which gives a better circulation. Another departure from the American locomotive is in carrying the four-wheel truck entirely in front of the cylinder and connecting to the back driver. The object of this is to get the weight of the cylinders nearly all on the drivers, and so do away with that amount of dead weight, which in ordinary locomotives has to be carried, by placing no more weight on the front truck than is absolutely necessary to make the engine track well. In some cases a pony or two-wheeled truck might be used, but where high speed is required and the track is not perfectly straight, the danger of being derailed is so great with a two-wheeled truck that not many American master mechanics would have the hardihood to use them.

With this style of truck the engine may be run with the same degree of safety as an ordinary eight-wheeled engine. This way of carrying the truck in front of the cylinders is very often used in the old world.

GENERAL SPECIFICATIONS FOR A FAST PASSENGER-LOCOMOTIVE ENGINE.

General dimensions: Cylinders 19 inches in diameter, 24-inch stroke. Two pairs of coupled driving-wheels 6 feet diameter, with a four-wheeled swing bolster truck in front of cylinder and one pair of trailing wheels under fire-box back of drivers. Gauge of road, 4 feet 8½ inches. Fuel, hard or soft coal. Weight of engine in working order, 103,000 pounds; on drivers, 87,000 pounds; on truck, 10,000 pounds; on trailing wheels, 5,000 pounds. Wheel-base, driving 7 feet, rigid, 15 feet 7 inches. Total of engine 29 feet 2 inches. Boiler, cylinder part and outside fire-box, of Otis steel, $\frac{7}{16}$ inch thick, riveted with ⅞ inch rivets, placed not over 2¼ inches from center to center, all seams to be double riveted. Diameter at front end to be 60 inches, made straight with one dome placed on middle of boiler, 32 inches in diameter, and 30½ inches high. Smoke-box, extended, 61½ inches in diameter and 92½ inches long, made of ⅜-inch iron. Fire-boxes to be 8 feet long, 46 inches wide at bottom, and 57 inches deep inside, made of steel. Crown ⅜ inch thick, sides $\frac{5}{16}$ inch thick. Fire-door sheet ⅜ inch thick. Combustion-chamber 38 inches deep, 52 inches wide and 42 inches long. Inside tube sheet ½ inch thick. The sides and crown to be stayed with ⅞-inch stay-bolts, screwed through and riveted over, placed not over 4¼ inches center to center. Water spaces 4½ inches front, 3½ inches sides, tapering to 4½ inches at crown; 4½ inches in center, tapering to 6 inches at crown. Tubes of iron, 200 in number, 2 inches O. S. diameter, No. 12, W. G. thick, 10 feet long, set with copper rings on fire-box ends.

	Square Feet.
Heating surface, tubes	1,040
" " fire-box	200
" " combustion-chamber	50
Total	1,290

Smoke-stack, straight, 18 inches in diameter. Frames of best hammered iron 4 inches wide, with pedestal and braces welded in. Front rails bolted and keyed to main frames, and pedestals protected by cast-iron wedges and shoes, the pedestal being connected at bottom by cast-iron thimbles and bolts. Driving-wheels, four in number, 72 inches diameter. Centers of best cast iron, with hubs and rims cored out, the centers turned to 66 inches diameter for tires to be shrunk on. Tires of best cast steel, 3 inches thick, both pairs flanged 6 inches wide. Driving-axles of best hammered iron; journals, 8 inches diameter, 10 inches long.

RIVAL LAND AND WATER TRANSPORTATION ROUTES.

A CONSIDERABLE portion of the current discussion of transportation questions and other intelligence bearing on such matters, hinges on the conflicting interests of land and water routes.

The magitude of the merchant navy of the United States is discussed in the annual report of the commissioner of navigation, and he directs attention to the fact that it finds employment chiefly in river, inland, lake, gulf, and coastwise traffic. The craft of various kinds includes 6,284 seagoing sailing vessels, of 2,138,880 tons, and 355 steamers, of 545,187 tons. The number of vessels employed in the different coasting trades and fisheries of the Atlantic and Pacific coasts, including the western rivers and all inland navigation excepting the northern lakes, on June 30th, 1885, was 19,123, and their tonnage 2,455,720. Of this number, 13,862 were sailing vessels, 4,111 steam vessels, 256 canal boats, and 894 barges. The total number of vessels engaged in the coastwise trade, excluding those engaged in the fisheries and upon the northern lakes and western rivers, is 15,918, and their tonnage 2,001,917. The commissioner says:

"If we include our lake and river tonnage it is the most formidable coasting fleet in the world, surpassing in point of tonnage the combined mercantile navies of any two nations, excluding Great Britain. In fact, the aggregate merchant tonnage of France, Spain, and Italy together falls short of the United States coasting marine. Moreover, this fleet of coasters of various kinds, built for conducting the traffic of our extended coasts and long rivers, is admirably adapted to the diversified variety of business it was constructed to perform. It is, in point of efficiency and equipment of vessels and accommodations and comforts for those on board, second to no fleet in the world. The coasting service is, moreover, thoroughly American, both in the increasing traffic it is intended to carry on and the peculiar style, models, and rig of the vessels themselves. No doubt the experience gained by our shipwrights and architects in drawing the lines of the fine models that are to be met with along our coasts has enabled them to build yachts that from the days of the *America* to the *Puritan* have kept the prize for fast sailing."

One of the general considerations which has scarcely received as much attention as it deserves is the effect, upon railway interests, of the influences that have confined the operations of American vessels chiefly to the coasting trade, and prevented them for participating extensively in commerce with foreign countries. It is only a comparatively small amount of the coasting trade that could not be conducted by some of the existing railway lines, and that is not now habitually carried on under conditions that necessitate sharp competition. If the available foreign fields for effort were more extensive and remunerative it is probable that they would attract at least some of the seagoing vessels now engaged in the coasting trade, and thus, perhaps, diminish the pressure to which a number of rival rail and water routes are now subjected.

There are also many home industries and classes of traffic which would presumably be more flourishing if the existing facilities for exportation to foreign markets from various domestic ports were improved, and it is possible that some railway lines would derive a double benefit from such an increase of oceanic shipping if it were supplied by vessels that are now engaged in the coasting trade.

It is true that leading ports are generally abundantly supplied with foreign vessels, but exclusive dependence upon them for the management of the foreign commerce of the country involves perils and uncertainties which might under some adverse circumstances become very damaging, and there are at all times promising or possible markets for American products in some parts of the world which will never be fully developed by operation conducted in foreign ships.

This subject has a close relation to the material welfare of the American people. Their prosperity depends, in a very large degree, upon the extent to which foreign markets can be provided for their surplus products, and the existing capacity to produce many useful articles greatly exceeds the existing home and foreign demand. Meanwhile very active efforts are being made by various foreign governments to provide satisfactory substitutes for the articles now exported from our soil. It is necessity rather than choice that makes Great Britain such a large purchaser of American breadstuffs, provisions, and cotton, and her statesmen and many of her merchants would prefer to make corresponding purchases from competing British colonial dependencies if their location and industrial development permitted such a change. What has already occurred in connection with the substitution of wheat from India for the products of our fields may be the forerunner of similar limitations in other directions. France and Germany have also imposed severe restrictions on some branches of our export provision trade. In brief, while we have been materially dimishing the American demand for European manufactures, some foreign countries have been equally successful in checking their imports of staple products of the United States. Instead of looking for a remedy to a reduction of our tariff, which might result in inflicting great injury on our manufactures without materially benefiting our agriculturists, steady efforts should be made to seek new markets wherever they can be found, and this work can never be prosecuted with the desirable degree of efficiency and success while the direction, management, and manipulation of our foreign trade is left, mainly, to and under the control of representatives of foreign interests.

For the reasons stated and other considerations which are perhaps even more cogent, it is highly desirable that practical methods should be devised for the encouragement or increase of American shipping devoted to foreign trade, and on all propositions conducive to this end there is a substantial harmony of interests between the representatives of national railway and water routes.

Various other classes of questions are discussed which embrace issues affecting the historic and incessant rivalry between rail and water lines. No other portion of the world has ever witnessed such struggles as have been waged for the control of many branches of the through traffic of this country. Nowhere else have railways reduced rates to a standard low enough to make them formidable rivals of long water routes. And nowhere else is the anomaly presented of a systematic advocacy of extensive governmental aid to water lines for the express purpose of enabling them to compete more effectively with rail lines built chiefly by private capital.

Illustrations of some of the prevailing tendencies were afforded by statements made during the recent debate, in the House of Representatives, at Washington, on the change of the rules of that body which were finally adopted. They included references to the Hennepin canal, a project that has evidently found enthusiastic ad-

vocates who are anxious that the United States should construct an expensive artificial water channel between the upper Mississippi and the northern lakes. A number of other schemes of equal or even greater magnitude were briefly mentioned, and it is supposed that one of the results of the new methods of conducting the business of the House will be to increase the chances of the success of schemes which aim at securing large appropriations for the improvement or creation of interior water routes. So far as the work of the session has been outlined, the indications point to hostile treatment of some of the land-grant roads, coupled with more favorable consideration than usual of various plans for improving competing waterways.

The utility of a number of the schemes has been greatly magnified. The interior transportation service of the country is performed mainly by the railways, and in all northern sections of the United States their labors are indispensable, on account of the closing of the interior water routes during a large portion of each year. The usual winter blockades have now been established, and in the absence of railway labors, ruinous and intolerable torpidity would reign supreme in many circles which have suffered only a slight diminution of ordinary activity. The course of events on the upper Mississippi, which is typical of most of the northern water routes, is illustrated by a statement that the ice gorged above the railroad bridge at Winona on the night of December 6th, thus closing the season after 247 days of uninterrupted navigation. Five thousand one hundred and twenty-five boats and 1,978 rafts rafts passed the bridge during the season. The *Josie* was the first St. Louis boat to arrive on April 10th, and the last to leave on November 17th. The Mississippi closed at Davenport on December 7th. This is ten days earlier than for the last two years. The season of navigation opened March 21st, three days after the ice went out. The close this year was very sudden, and the ferry, which made regular trips until within a few hours of the ice blockade, had difficulty in getting into winter quarters.

In referenee to the general characteristics of the traffic now conducted on the Mississippi the following statement, attributed to a prominent railway official whose name is not published, is going the rounds of the western press:

"There is not half the benefit derived from the Mississippi river that the people are led to believe. The railroad companies carry freight at as low a rate as the boat lines, and besides give better service by fast time and prompt delivery. The boats do very little, if any, through business; it is only local traffic they carry. And what town of any size slong the river is not touched by a railroad? There is a sufficiency of roads to transport all the produce the country furnishes, and the competition among them keeps the rates on a basis with that charged by the boat lines. If the railways did right they would compete with the boat lines while navigation is open in such a way as to surprise them and compel them to tie their boats up to the nearest swing-bridge on the river, and in the winter make the shippers, who were inclined to favor boat against rail, pay such a rate on every article they ship that it would draw the life blood from their hearts. The railroads are in a position to do it if they wanted to. But they were built for public benefit, and they did not apply to congress every year for aid or a certain sum of money to maintain them and make necessary improvements.

"No; when boat lines perform the service of a well-managed road extending along the bank the same distance as boat lines run, then it is time canals were run all over the country, and the first man to mention railroads should be lynched. Of course the Mississippi river is a strip of water owned by the government, and the government does not want to see it become clogged with snags, or mountains growing in its center, or resting places for ducks and geese. No; it must be kept in proper light before the public, especially foreigners, so that the historical Mississippi may appear to them all that has been said of it. If it is kept in an improved condition and boats run regularly between points, the railroad companies do not care, for their traffic is not noticeably diminished by the competition. None of the companies owning a line of boats running between St. Louis and St. Paul find them paying. I'll bet you they are losing money every day, but continue to run in the hope of better times. There is no through business between St. Louis and St. Paul to speak of, and the result is that the boat lines depend almost entirely for the trifling business picked up between points, for which they ask what a railroad man would call a very remunerative rate. This is why we do not believe in congress appropriating money for the improvement of waterways, because it really does not benefit the country tributary to the point where the improvement is made when there is a railroad in that district, for the railroad can carry all the business at as low a rate in the end to the shipper as the man owning the boat can. This, then, is only beneficial to the few individuals who own the boat transportation lines, and when congress makes an appropriation for the opening of canals and rivers it is for the benefit of a certain few individuals who wish to embark in new enterprises aided by the public."
—*Railway World.*

Comparative Cost of Operating American and English Railways.

In a paper read at the October meeting of the American Society of Civil Engineers, Mr. E. B. Dorsey gave the following facts relative to the comparative cost of operating railways in this country and in England:

The roads north and west of London pay on an average 6s. 8d., or $1.60 per ton of 2,240 pounds, and roads running south of London 12s. 6d., or $3 per ton, which price is that of the coal delivered to the railways. The wages of engine-drivers and firemen in England average 6s. 8d. per day, equal to $1.60, and in America $3.60, while the latter in England average 3s 9d., or 90 cents, and in America $1.90. To equalize the comparison of operating expenses, then, coal should be assumed in the United States at $1.60 per ton, and the scale of wages reduced 45.5 per cent.

Then, again, the English railways are considered so much smoother than the American that the engines ought to show favorably on the repair question; but in spite of all, the average cost of repairs and renewals of locomotives on fourteen railways in England came to 7.8 per cent. of the total operating expenses, while on eight American railways it was 5.7 per cent., or one-third less. This goes to show that the outside-cylinder engine (American type) does not wriggle herself to pieces so much as she was thought to do. As labor is the chief expense in railway repairs, the wages in the United States should be reduced 50 per cent. to put the comparison above on its merits, which gave 4.3 per cent. for American engines against 7.8 for the English, nearly one-half.

In regard to maintenance of way the average cost on fourteen English railways was 17.8 per cent. of total operating expenses, and on the eight American railways 21.6, or 4 per cent. more. This does not take into account the difference in wages between the two countries.

In regard to passenger-cars the cost of renewals is about the same, being $1.27 in England as against $1.34 in America per 1,000 passenger-miles; but it must here be considered that 86 per cent. of English travel is third-class, where first cost and repairs must be very small, and it is fair to say the renewals and repairs of first-class cars must be at least three times the cost of repairs and renewals in America. In regard to motive-power Mr. Dorsey has been surprised to find it was nearly double

in England as compared to America, for he had expected the reverse. To ascertain if it was not accidental, as he had based it on one year's business, he has constructed a table, which shows comparisons for 1882, 1883 and 1884. The English roads selected are five doing the heaviest traffic, and those of America, with the exception of the New York, New Haven and Hartford, run through a country with greater natural difficulties. In Massachusetts the coal costs from $4 to $5 per ton, and again the question of wages should come in with its 50 per cent. reduction.

Supposing, he says, that the largest ton and passenger haulage of the American lines influenced the result in their favor, the same calculation on the same basis, except the taxes are included in operating expenses, has been made for 1884 on many of the short railways of Massachusetts where the average haulage is very small. The results of the workings of these small, short railways are still more favorable to the American system.

From the superficial observation it is difficult to say what is the cause of this great additional cost in motive-power in operating the English railways when it should be much less than that of the American railways, owing to their average superior construction, with easier grades and curves. Apparently the most prominent cause of this increased cost is the great speed and small tonnage of the freight-trains. Perhaps the American bogie rolling-stock runs with less friction than the rigid wheel-base rolling-stock used on the English roads. It would certainly pay the management of the English railway companies to investigate the cause of the extra cost and if possible remedy it. If this can be done they will be able to decrease the operating expenses over 8 per cent. without making any changes whatever in the present prices. This will enable most companies to increase their dividends largely, probably over 4 per cent. For what is done in the United States ought to be done in the United Kingdom.

It is claimed that English government taxes and duties are onerous; they were found to average 7 per cent. of the operating expenses in England and 5 per cent. in America, and further, that the English charges for passenger travel are about double the American.

State Ownership of Railways a Failure.

THE experiment of buying out the private railways, which has been tried by the German government with such apparent success, has not been attended with anything like equally satisfactory results in Austria and Hungary; and these latter countries have decided to stop, for the present at least, the acquisition of railways by the state. The railway work of the present parliament will be limited to the two bills for purchasing the Prague-Dux and Dux-Bodenbacher lines which have been a long time in preparation, increasing the rolling-stock of the state lines, authorizing additional capital for the Austrian North-western railway, and passing a new law for local lines. Even the two bills in question are strongly opposed by the railway committee itself. It is said that the extension of state lines should be postponed until the question of state ownership in railways was decided. As a matter of fact there is nothing to wait for, as it is already clear that the results shown by state lines will be worse this year than last, a 2 per cent. dividend on the capital invested being the utmost that will be earned. The outlook being thus very discouraging, there is already some talk in well-informed circles of handing over the state lines to private companies again, thus clearly demonstrating the utter failure of the system. Under these circumstances the suggestion of the Gratz chamber of commerce that the state should purchase the South Austrian railway will produce no results.

The question naturally arises, says the London, (Eng.), *Railway Times*, why is the system of state railways such a failure in Austria and so successful in Germany? The answer is that the latter country's success is only apparent. Germany's credit is much higher than that of Austro-Hungary, and as the owners of private lines were paid in government bonds the state made a much better bargain than is possible in the dual kingdom, so that a financial success is more easily shown in the fatherland, but at the expense of the public. The German government, as owner of all the great lines and possessing the monoply of both goods and passenger-traffic, has been able to economize in many directions by running fewer trains, raising rates, providing less comfort and accommodation, etc., quite regardless of the public who have no choice but to use the state lines. This disregard is proved by the fact that letters from London are only delivered once a day in Berlin while Frankfort-on-the-Main has two deliveries. Formerly Berlin had also two, but now that all the eastern lines are state property, while to Frankfort there is a competing private line, things are changed. Such a state of things is impossible in Austria, where the press would raise an outcry that would soon put a stop to such manœuvers; but in Germany nobody dares to say a word when once Prince Bismarck, the originator of the state railway system, has made up his mind. That the German practice must injure the trade is obvious, and it is equally clear that without crippling commerce and putting passengers to discomfort and inconvenience the state lines cannot pay. It appears, therefore, that this much praised system is an imposture and it is to be hoped that other countries will profit by the lesson taught them by Germany and Austria.

The Waste of Whistling.

THE nuisance of the steam whistle in populated neighborhoods has been frequently mentioned, says the *Scientific American*, and in some localities municipal ordinances and railway managements have restricted its use. But it is seldom that the cost, expense, and waste of the steam whistle is mentioned. And yet the blowing off of steam through locomotive whistles alone must entail an enormous waste of fuel. Steamboat whistles and the utterly useless stationary engine whistles must make, in the aggregate, an enormous waste to the purchasers of fuel for steam-boilers. From recent reports it is seen that there are 1,940 grade-crossings in the two states of New Hampshire and Connecticut. Probably not less than an average of twelve trains cross these roads daily; at each a locomotive whistles under a pressure of about 110 to 120 pounds the square inch, The aggregate amount of steam thus blown off into noise is very great.

The steam from a whistle escapes in an annular space

around the bowl; and if the whistle is six inches in diameter and the annular space is only one thirty-second of an inch wide, the total escaping space will be more than one-half square inch. That much steam is required to supply a steam whistle is evident from the fact that all steam whistles have for their connecting stems very generous steam pipes: and also from the fact, patent to every observer, that as dense a cloud of vapor is formed from the steam of the whistle as that escaping from the safety valve in the same time.

The superintendent of one of the most important railways in the country, himself a practical engine-driver, says that when he was a locomotive engineer he was requested by the committee of a local political demonstration to toot his whistle persistently as he approached the depot from a point nearly a mile from the station. He did so, and ran his steam down so that his passengers had either to walk from the stationary train or wait until steam could be gotten up. The writer once in whistling two refractory oxen off his road ran his steam down from 120 to 80 within less than two minutes, and the fireman piling in the wood all the time. The superintendent to whom reference has been made believes that for the time the ordinary steam whistle is used, more steam is required than is used for driving the locomotive with its double cylinders and pulling a train of cars. The whistle demand of steam is a constant one during its use—not intermittent like the admission of steam to an engine cylinder: and the size of the pipe—not less than one and one-half inches—permits a very large amount of steam to escape under a pressure of 120 pounds to the square inch. This authority, with others of practical knowledge, says that thirty-five cents per day for the tooting of steam whistles on running trains is a very low estimate of the cost. This does not include depot yard work. And no estimation is conjectured as to the waste of steam and cost of fuel for the steamboat and steam-tug whistles and those of stationary boilers. But for exactive legal enactment and obstructive legalized orders, much of the useless waste of whistling and much of its abominable annoyance could be stopped and abated.

A still more exact statement is that of a well-informed railway man, who says that the expenditure of fuel for each locomotive on the New York, New Haven, and Hartford road each day is about one-eighth of a ton; this only for the legally required soundings at grade-crossings. This would make for this one road, the cost of fuel, for grade-crossing whistling alone, not less than $15,000 per year.

A Locomotive's Surprising Record.

LOCOMOTIVE No. 137 on the Boston and Albany Railroad, used in the passenger-service, has a very remarkable record. It came out of the shops new April 23rd, 1883, and on October 30th, 1885, was sent in for general repairs, having in the meantime—for 30 months and seven days—made daily trips. The average run for the 921 days was 203 miles, or an aggregate of 184,726 miles. During this time only 12 days were lost for repairs, and no repairs were made until April 27th, 1884, when the engine had run 78,812 miles. During portions of the months of April and June and the whole of the month of May, the engine ran 400 miles every day, making (with extra trips Sundays) 10,910 miles in May, and a total of 26,740 miles in the three months named, or an average of 8,913 miles per month. The 12 days lost for repairs were distributed over the period from April 27th, 1884, to October 30th, 1885, and, in almost every instance the repairs were of an unimportant character and in the shape of renewals.

The driving-boxes of the engine were of cast iron, but have lately been replaced with steel. The weight of the engine is 42 tons, its cylinders are 18 x 22 inches, its driving-wheels 68 inches in diameter, and the boiler 52 inches in diameter. There are 231 two-inch tubes, and the steam-pressure is 160 pounds.

A New Adaptation of Electricity.

TELPHERAGE is the name which has been given to a system of automatically transporting goods by the agency of electricity as the motive-power, which system was the invention of the late Professor Fleeming Jenkin. Dying in June last, however, the professor did not live to see his ingenious ideas carried out on a practical scale. He had begun the construction of a telpher line on the estate of Lord Hampden, at Glynde, near Lewes, but his plans had to be perfected by Professor Perry, his successor as the engineer to the Telpherage Company. This line has been completed, and was formally opened on Saturday, October 17th, by Lady Hampden, who electrically started a loaded train on the line. A special train conveyed a large number of visitors from Victoria station to Glynde, among the company being Sir Frederick Abel, Admiral Sir Edward Inglefield, Mr. W. H. Preece and Professor Ayrton.

The line is a double one, nearly a mile in length, and is composed of two sets of steel rods three-quarters of an inch in diameter, supported on wooden posts of T-shape, and about eighteen feet high. The wires are supported one on either end of the cross-piece of the "T," which is eight feet long. The carriers, or skips, as they are technically termed, are iron, trough-shaped buckets, each holding about 2 cwt., and suspended from the line by a light iron frame, at the upper end of which is a pair of grooved wheels running on the line of rods. A train is made up of ten of these skips, which are in electrical connection with each other, and with an electric motor which is placed in the middle of the train, having five skips in front and five behind it.

At a point about midway of the length of the line is the engine-house, in which is a steam-engine which drives the dynamos. From these latter the current is led to the line, and thus to the electrical motor which moves the train. The use to which the line is put is to carry clay from a pit to the Glynde railway siding, whence it is delivered in trucks and transported by rail to the works of the Newhaven Cement Company. At the charging end of the telpher line the skips are loaded each with about 2 cwt. of clay, the train thus carrying one ton. A laborer, by touching a key, starts the train which travels at a speed of from four to five miles an hour along the overhead line to the Glynde station. Arrived there, another laborer upsets each skip as it passes over a railway-truck, into which the clay is thus loaded. This upsetting, however, will eventually be performed automatically by means

of a lever on each skip, which will come in contact with a projecting arm as it passes over the truck. The laborer at the discharging end of the line has full control over the train, and can stop, start and reverse it at will, as can also the man at the other, or loading end.

There are two trains at Glynde, but only one is at present used, that being found sufficient to deliver 150 tons of clay per week at the station—the minimum quantity required by the cement company. The trains need no attention when running, as they are governed to run at the same speed both on rising and falling gradients. An automatic block system is provided, so that as many as twenty trains can be run on the line without the possibility of collisions. The telpherage line at Glynde being the first erected, it is admitted that its details are capable of improvement. It, however, successfully demonstrates the ingenious idea of Professor Jenkin in utilizing electricity as a source of motive-power. Beyond this it can hardly be said to go at present.

High-Speed Engines for English Roads.

ACCORDING to *Engineering*, the Northeastern Railway Company are at present having built at their works in Darlington and Gateshead twenty new engines, to be used solely for express purposes. At the Darlington North Roads Works ten of the engines are to be built. One is already completed. It runs upon four wheels (coupled) and is seven feet two inches in diameter. The diameter of the leading wheels is four feet and six inches and that of the centers eight feet six inches, the total wheel base of the engine being sixteen feet eight inches. The cylinder is eighteen inches in diameter and has a twenty-four inch stroke. The boiler pressure is one hundred and forty pounds per square inch, with total heating surfaces of about 1,400 feet. The tender is upon six wheels of three feet six inches diameter, with steel axles. It will hold 2,800 gallons of water and carry three tons of coal. The general fittings throughout are of the most approved character, and adapted to meet all modern requirements. The weight of the engine with steam up is forty-two tons, and that of the tender, twenty-eight. All the engines are to be of the same type, and are to be called "Tennant's Express Passenger-Engine." They will be capable of running express from York to Edinburgh and *vice versa* in one journey; hitherto it having been necessary to employ two engines to accomplish the same distance. In a trial run of the engine a speed of eighty miles per hour was attained. When the engines are finished the Northeastern will possess engines, for finish, build and general excellence, unequalled in the country.

The Philadelphia and Reading Road.

AT the annual meeting of the shareholders of the Philadelphia and Reading Railroad held in Philadelphia, on January 11th, Mr. Franklin B. Gowen was unanimously elected president. Mr. Gowen retired from the presidency of the road two years ago and was succeeded by Mr. Keim, the receiver of the road. The report of the retiring president gives the followiug figures for the year ending November 30th, 1885: Net earnings of the railway company, $12,652,249; deficit in earnings of coal and iron company, $124,679; for both companies net earnings, $12,527,569. The operations of the railway company, deducting that of the system of the Central Railroad Company of New Jersey, have resulted in: Net earnings, $8,050,983; total fixed charges, including full charge of interest and rentals, $10,244,809; deficit for the year, $2,193,826. The deficit in the operation of the Central Railroad of New Jersey for the year is $1,338,377.

The rumors that have been current since the election of Mr. Gowen to the presidency of the company, that he intended to go abroad again to raise $20,000,000 for the creation of a trust fund to be used in paying off the pressing obligations of the company, and take it from the hands of the receivers, are stated by those who know, to be entirely correct. It is understood that before his recent return to America he spoke to a number of English and German capitalists on this subject, and that he received from them gratifying assurances that, should he succeed in his efforts to replace himself at the head of the company, they would provide the money to carry out his purposes. When questioned on the subject he declined to state whether or not there was any truth in the rumors.

Railways in Iowa.

ACCORDING to the report of the Board of Railroad Commissioners of Iowa for the year ending June 30th, 1885, there are now in that state 7,478 miles of railway in operation. The increased mileage over the previous year is reported at 1,280. The total cost of the roads was $266,-784,535.99. The total amount of taxes paid by the railways was $768,274.43; 58½ per cent. of the entire track in the state is laid with steel rails. The gross earnings of the Iowa roads during the year is given at $36,123,587.45, and the operating expenses at $23,093,881.04, leaving net earning of $13,030,096.41. The total stock of the roads is stated as $400,699,755.03, and the total debt as $457,081,-918.34. The total number of persons reported as employed regularly in operating the roads in the state is 25,666; the amount paid for their services is $13,628,067.66, or $598,061.25 more was paid for personal services in operating the roads in the state than the net earnings.

Dimensions of Cars used on the Pacific Roads.

THE Chicago, Burlington and Quincy Railroad has sent out the following circular:

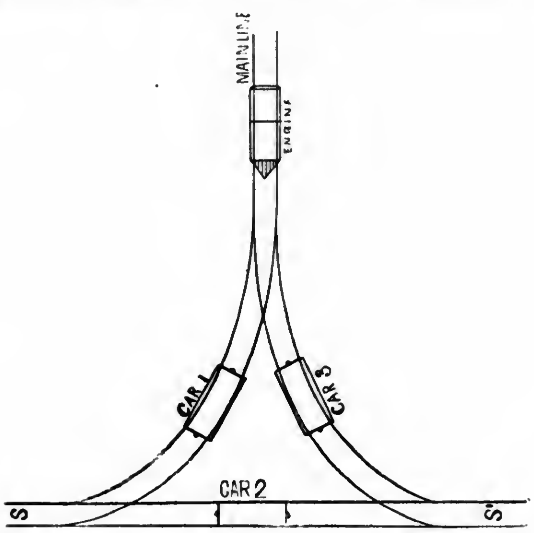
The Transcontinental Association notify us that owing to the natures of grades, tunnels, snow-sheds, etc., the following are given as the maximum outside dimensions of box-cars which it is safe to run west of the Missouri river, viz.: Length, 25 feet: height, 12 feet 6 inches from level of top of rail to the top of eave or edge of roof on side of car; width, if height is not more than 12 feet from top of rail, 10 feet; if height is over 12 feet, and not over 12 feet 6 inches from top of rail, maximum width will be 9 feet 6 inches.

Agricultural implements, wagons, and similar freight, when loaded on flat-cars, should not be loaded to exceed 11 feet 6 inches in extreme height above the top of the rail, or 9 feet in extreme width, and should be well secured by iron rods passing over the load, and connecting the upper ends of the stakes in such a manner as to prevent

spreading, The companies reserve the right, when the above are not complied with, to refuse the freight, to transport it entirely at owner's risk of injury from collision of tunnels, water-tanks, snow-sheds, etc., or to remove any excess from the car and charge first-class rates on the same. Cars which exceed these dimensions in any particular will not be received by the lines west of the Missouri river, neither will they pay mileage for the use of cars exceeding 30 feet in length owned by individuals or corporations other than regular transportation companies. All Chicago, Burlington and Quincy cars, including our large furniture-cars, come within the limit of dimensions to permit of their going through to California points without transfer,

Solutions to the Problem in Car-Drilling.

THE following solutions to the problem in car-drilling given in the December JOURNAL have been received. As shown in the cut, the problem was to turn the engine on the "Y" and restore each of the three cars to its original position. The stub-switches S and S′ hold but one car or engine, and each arm or end of the "Y" the full train.



POWASSAN, ONT., January 5th, 1886.

Editor American Railroad Journal:

DEAR SIR.—The following is a solution to the switching problem given in your December issue:

1. Couple engine with car 3.
2. Run it out on main line.
3. Shove it down to car 1, leave the two clear of all switches and on upper arm of "Y."
4. Run engine around to car 2, empty and shove car 2 onto stub-switch S.
5. Run engine back to car 3, again empty.
6. Pull all three cars, clear, on upper arm of "Y."
7. Run engine around empty again behind car 2.
8. Shove all three out onto main line, clear of switches.
9. Now run your engine clean around the "Y," empty, and you will have it standing in same direction as when the solution began. After this the three cars can be put back in same manner as they were taken out, only the order of process being reversed.

Yours very respectfully,
CECIL B. SMITH, B. A. S., C. E.,
Northern and Pacific Junc. Railway.

PALESTINE, ILL., January 1st, 1886.

Editor American Railroad Journal:

DEAR SIR.—I offer the following solution to your problem in December, 1885, number, in drilling cars:

1. Engine puts car 3 between itself and car 1.
2. Engine runs through stub-switch S′ and pushes car 2 onto stub-switch track S, returning the way it came to main line.
3. Engine pulls train onto track stub-switch S side in order, beginning at engine, car 3, car 1, car 2.
4. Engine runs through stub-switch S′ and S, placing itself behind train when it will be turned once, and pushes train on main line.
5. Engine runs back through stub-switch S and S′, when it will be turned the second time, runs up to train on main line and pulls train back onto track on stub-switch side S′.
6. Engine runs through stub-switch S′ and S onto main line when it will be turned the third time and stand at head of train.
7. Engine pushes car 2 onto stub-switch track S′.
8. Engine runs through stub-switch S and pulls car 2 to original position, and returns as it came to head of train.
9. Engine pulls train onto main line, then backs car 1 to original position on stub-switch S side, returns with car 3 to main track, pushes car 3 to original position on stub-switch S′ side, and runs out to its own original position where it will be turned as proposed.

Respectfully yours,
CHAS. SEYMOUR,
Chief Engineer, Bloomfield Railroad.

A still more difficult problem in car-drilling will appear in the February JOURNAL.

IT is rumored that the Baltimore and Ohio Railroad may utilize the Morris Canal for railway purposes in Newark, N. J. The canal is said to have been run at a loss for some years by the Lehigh Valley Railroad Company, its lessees. The Lehigh Valley Company is said to have recently had a proposition to unite with the Baltimore and Ohio Railroad Company, and run trains on the bed of the canal. The canal company has the right by its charter to use the canal bed for the running of trains. Such a combination between the two roads would give the Baltimore and Ohio an outlet at the Jersey City water-front.

A COMPANY has been formed in Pennsylvania, chiefly of Pittsburgh capitalists, for the purpose of building a railway across Kentucky into Tennessee. The line of the proposed road was surveyed from Evansville, Ind., down through Dekoven, Ky., to Jackson, Tenn. It is to be called the Ohio Valley Railroad and extends in a southwesterly direction, opening up a portion of country the richest in mineral and agricultural products of any part of the state. The line will be 200 miles in length and the cost of building will not exceed $2,000,000.

THE value of the coal mined in the United States in a year far exceeds that of all the gold and silver combined. From government reports just issued it appears that the coal yield of 1884 was $143,760,000, that of silver, $48,800,000, and of gold, $30,000,000; the coal product thus exceeding the combined product of silver and gold in value by $64,160,000. In the annual production of coal Great Britain ranks first, followed in regular order by the United States, Germany, France, Belgium and Austria.

THE Pittsburgh, Cincinnati and St. Louis Railway Company has ceased to operate and control the Cincinnati and Muskingum Valley Railway. The following appointments have been made upon the latter road: John E. Davidson, Pittsburgh, Pa., treasurer; F. G. Darlington, Zanesville, O., secretary and superintendent; John W. Renner, Pittsburgh, Pa., auditor; Geo. W. Davis, Zanesville, O., general freight and ticket agent, and John S. Brasee, Lancaster, O., solicitor.

AS reported by the bureau of statistics the mineral oil exported from the United States during the past year, aggregated 558,086,619 gallons, valued at $49,214,281. The exports in 1884 amounted to $542,217,728 gallons valued at $49,108,511.

American Railroad Journal.

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NEW YORK, JANUARY, 1886.

Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

RAILWAY CONSTRUCTION IN 1885.

As far as reported the total new railway construction in the United States during the past year amounted to 3,113 miles. These figures refer to the main track only, exclusive of second tracks and sidings. It is probable that later reports will increase this mileage somewhat but not to any appreciable extent, and the record shows that the railway construction of 1885 fell below that of any previous year since 1878. Beginning with 1879 the annual construction increased yearly up to 1882, in which year it reached the high figure of 11,596 miles, and then steadily decreased until the low-water mark was touched last year. For that the record of 1885 will prove to be a low-water mark we have little doubt. The present year promises to show a healthy increase in railway construction, though possibly not as marked as the increase of previous years.

Nevertheless, despite the low record of last year it is by no means a bad record. Of the recorded construction little can be classed as speculative. The condition of our railway industries was not such as to warrant construction save where its need was apparent, and there is reason to believe that nearly every mile of new road constructed last year was the result of careful and honest deliberation, and prompted by the needs of traffic. Therefore, it is fair to assume that the new mileage will prove profitable, and that it will not contribute to swell the burdens of railway receivers, which of late has too often been the destiny of newly constructed lines.

If the record of new construction during 1886 amounts to 3,500 miles there will be no reason for complaint. The increase over 1885 will not be great but it will be a tangible proof that railways are making haste slowly in the matter of new construction. Even if the record should fall below that of last year there would be no cause for alarm. As we before stated, there has been an over-production in railway construction of late years, and the railway industry is amenable to the laws of supply and demand almost to the same extent as manufactures. No harm will ensue if the country suffers a little for lack of railway communication for a year or two. The past few years have demonstrated most conclusively that there have been too great railway facilities offered to admit of reasonable profit to the investors, and a period of enforced abstemiousness in the matter of construction will give tone to the railway system.

Still, we believe that the present year will show a slight increase, which increase will prove an index of the actual needs of the country; and not only the actual needs but the immediate needs. Railway investors are not so prone as formerly to discount the future, and this year the railways will grow to the needs of the country, and not, as previously, the country grow to the facilities of the rail-

ways. The speculative era is past and will not return for some years to come, and herein is one cause for thankfulness. Nor is this the only cause. The evils of parelling have been brought to notice, and the wanton extravagance of railway receivers has been held up for condemnation. Altogether we start the new year with indications of a healthy development of railway interests.

REDUCTION OF EXPENSES.

IN a recent article, the Toledo *Blade* holds to the opinion that when a curtailment of expenses becomes necessary on a railway and a reduction of wages is decided upon, this reduction should not be confined to the engineers and train-hands generally, but embrace every official from the president down. The case of the Philadelphia and Reading road is instanced, where the higher officials are receiving liberal salaries while the road is involved in hopeless bankruptcy. In the argument employed there is a good deal of that species of logic known as buncombe. It is stated that the counsel fees all told amount to $120,000, but we fail to see that this item is so very exorbitant when we consider the legal difficulties with which the road is contending. Neither do we consider that the $15,000 yearly allowed to the receiver is an extravagant remuneration, for it certainly compares very favorably with the claims put forth by receivers of other roads—the West Shore for instance. In fact the salary list of the Reading road, which the *Blade* seizes as a basis for its argument, appears to be decidedly moderate. Despite its bankruptcy the road is admirably managed, is fully alive to the requirements of the times and keeps abreast with railway progress in general. It is evident that its officials are in every way competent to fullfill the trusts imposed upon them, and we do not think their salaries are unduly liberal.

The railway official is, or should be, a man of peculiar aptitude. Railway management is not a trade nor even a profession. It partakes more of the character of an art. To a certain extent a railway official must by nature be fitted for his place. Whether he be a president or a superintendent he must be, above all, a railway man, and the supply of true railway men is limited. Naturally they command their own price and are generally paid no more than their services are worth. True, when the question of receivership is discussed, much can be said on the other side. The modern railway receiver is rarely a railway man and his services are generally inordinately remunerated, but apart from this anomalous railway official—if indeed he can be called such—the average officer of a railway is a man whose services are highly valuable, and the more so because of the comparatively small number of men who are fitted for such trusts.

In the matter of the reduction of employés' wages it can safely be said that the occasion is rare when such reduction is made save as a last resource. As a rule, the wages of employés are regulated by well-known standards and these wages are generally fair. The railway employé is of necessity a man of intelligence and he is subjected to a thorough training before he becomes a full-fledged employé. But apart from this intelligence and training there is little call for special aptitude. An engineer must be a man of cool temperament, sober, reliable, and of considerable nerve; but these attributes are not especially rare and it follows that the supply of competent locomotive engineers is generally fully up to the demand. Consequently the wage question will settle itself. The engineer will accept whatever wages he can get, and the amount thereof is determined by the willingness or the unwillingness of other equally competent engineers to work for less. So it is with all railway employés as distinguished from railway officials. The one class are trained up to their fitness—the other to a great degree possess an innate fitness which no amount of training could implant, although, of course, training greatly enhances the value of their services.

It is folly to class the railway official with the railway employé. As well might the author be classed with the type-setter, or the artist with the picture-frame maker. The one is a man of special aptitude, special fitness, and special ability; the other a man of general intelligence and general capacity, his training alone being special. The one, to a greater or less extent, will command his own price, and the wages of the other will be regulated by the laws of supply and demand.

It is true that instances are not wanting where the employé has developed into the official, but such promotion arises not through training but through a special fitness which the employé possesses. It is also true that the railway employé perhaps stands as the representative of the highest type of skilled labor; but skill is not talent, and the railway official must have the latter.

On the whole such discussions afford little profit. The matter may be relied upon to shape itself, and a railway may in general be trusted to reduce its expenses in a manner which will least injure its efficiency. But such reduction cannot be effected on communistic principles.

EDITORIAL NOTES.

THE recent conference between the Brotherhood of Locomotive Engineers and the management of the elevated roads in this city, is a further instance of what may be accomplished if both parties to a disagreement endeavor to meet each other in a spirit of fairness. An honest intention to do what is right and accord to each side the

justice due, will, nine times out of ten, avert strikes; and the amicable settlement of the dispute between the elevated roads and their engineers is simply due to the fact that neither side attempted to secure an unfair advantage. The various trades-unions would do well to follow the general policy of the brotherhood, where no attempt is made to boycott employers.

* * *

CONGRESS is in session and the country awaits with interest the outcome of the deliberations of their representatives under the first Democratic administration for twenty-five years. So far, President CLEVELAND has shown himself to be alive to the interests of the country and pretty generally seems to be on the side of commonsense. Whether or not congress will conduct itself with wisdom and moderation remains to be seen, and congress is a very uncertain body. But certain it is that the members of the forty-ninth congress have it in their power to make or mar the first portion of President CLEVELAND'S Administration.

* * *

AND speaking of congress it is to be hoped that it will early in the session take steps toward the passage of a Bankruptcy Bill. Too long have we been without one, and it is high time that the advocates of various measures to accomplish this end should come together and decide upon a bill that will answer the requirements of all sections of the country.

* * *

THE recent "cut" in rates to the west by the Baltimore and Ohio has disturbed the pool lines more than they are willing to admit. The staid old road is rapidly coming to the front as one of the trunk lines, and sooner or later will be in a position to demand recognition as such. In the meantime the Staten Island bridge question, on which the Baltimore and Ohio has pinned its hopes for admission to New York, has been brought up both in congress and in the New Jersey legislature, and hot fights in both bodies may be expected.

* * *

STANDARD time has now been with us for three years and it has proved an incalculable blessing not only to the railways but to the whole country. Therefore we chronicle with pleasure the presentation, by a committee from the Southern Time Convention, of an appropriate token of regard to Mr. W. F. Allen, of the National Railway Publication Office, in appreciation of his energetic services in securing the general adoption of standard time.

DR. ROBERT GRIMSHAW, formerly editor-in-chief of the *American Journal of Railway Appliances*, is now conducting *Mechanics*, with which publication he has incorporated his new journalistic venture, *Practical Progress*. The first number of *Mechanics* under its new management is an admirable one, and the high reputation of its editor is a sufficient guarantee of its value and interest. *Mechanics* is published monthly at 169 Broadway, New York, at $1.00 per year.

THE *Century's* war series is continued in the January number in the form of two papers, "The Second Battle of Bull Run," by Gen. Pope, and a continuation of the "Recollections of a Private," by Warren Lee Goss. An illustrated article on "Some European Republicans," by W. J. Linton, and the conclusion of ex-Minister Benjamin's illustrated description of "The City of Teheran," are among the contents of this excellent number.

Outing has removed its office of publication from Boston to 140 Nassau street, New York. This change cannot fail to prove of benefit to the publication, and in its new home it will doubtless continue its career of unbroken prosperity. The January number is excellent, as usual.

MR. F. B. BROCK, of Washington, D. C., attorney and solicitor of patents, has issued a pamphlet giving in full the official rules of practice of the United States Patent Office. The pamphlet is of great value to inventors intending to secure patents.

A COPY of the third annual report of the Board of Railroad Commissioners of the State of New York is received, but too late for extended notice in this issue of the JOURNAL.

A PHOTOGRAPHIC plate of "Representative Parisian Journalists," with their autographs and respective journals, is the latest novelty issued by the enterprising firm of Root & Tinker, of this city.

Power and Transmission, a journal devoted to manufactures, mills, science, art and invention, is a new and interesting little monthly published at Mishawaka, Ind., at fifty cents per year.

The Mining Review, published in Chicago, is another candidate for favor in mining circles. It has numerous departments and shows signs of careful editing.

Paper and Press is a handsomely printed and well edited publication devoted to the interests of the paper and printing trades. It is published in Philadelphia at $1 per year.

THROUGH the courtesy of the Iowa Railroad Commissioners advance sheets of their eighth annual report have been received.

GERHARDT'S safety car-truck, an advertisement of which appears on another page, seems to meet entirely the requirements of a safety appliance which in event of the wheels leaving the track, or of an axle breaking, will maintain the trucks and cars in their proper position and avert loss of life and property. It appears to answer a long-felt want, as was mentioned editorially in the December JOURNAL, in lessening the chances of disaster in railway accidents. The device was described at length in the October JOURNAL.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

THE QUESTION OF HEATING.

WITH all their enterprise American street-railways move with remarkable slowness in adopting means of heating their cars. We do not believe that the question of cost enters into their seeming opposition to warm cars, for the expense would be but trifling. Neither do we believe that they are deterred from adopting some heating system for the reason that its introduction would seriously lessen the accommodation of the vehicles, for it has been successfully demonstrated that at the outside the heating apparatus need occupy but the space of one passenger. More likely is it that the indifference of street-railway officials to this important subject is owing to the fact that the days of excessive cold, when street-cars become uncomfortably frosty, are rare, and occur at considerable intervals; and before the grumbling of passengers becomes wide-spread, the weather moderates and the cars again are comfortable despite the absence of stoves or other means of heating.

Nevertheless, a winter rarely passes that we are not visited by cold snaps that render our street-cars anything but comfortable, and unquestionably a long ride taken in one of them subject to the constant draughts induced by the frequent opening of the doors for the entrance and exit of passengers cannot be a healthy undertaking. A severe attack of cold weather is consequently followed by a diminution of travel in those lines of street-railway where the cars are not warmed, and we have no hesitation in expressing the belief that the resultant financial loss to such companies amounts to more than the cost of maintenance of a satisfactory heating system.

Of heating systems there is a variety to choose from. If stoves for any reason are deemed unsatisfactory and inconvenient, there are systems that employ methods of steam and hot-air heating by means of storage. Still again, we observe that a system of chemical heating by the use of soda has lately been introduced in England with indications of success when it shall have been perfected. Nor need there be any fear that any heating system will prove a nuisance by reason of its inducing an unhealthy and superabundant heat. The frequent opening of the car-doors and the ready means which the ventilators afford to reduce heat and purify the air obviate any objections on that score. And at the same time it must be remembered that it is not essential that cars shall be heated during the entire winter. Such heating need only be resorted to in decidedly cold weather, which in the latitude of New York City occurs but comparatively rarely.

Altogether there appears to be no sound reason why our street-cars should not be properly heated—or at least the chill taken off them—in seasons of extreme cold, and we believe a little agitation on the subject will bring such a desired innovation into general practice.

STREET-RAILWAY agitation in New York City still continues and the latest project is to operate a cable road on Fifth avenue. Apparently this one remaining thoroughfare which so far has escaped the gridironing of street-railway operators exerts a strange fascination. Whether or not the project will be carried through remains to be seen. Certain it is that the board of aldermen move a little more cautiously this year than last. Or, perhaps, they hold their services at a little higher price. Practically the effect will be the same.

PUBLICITY OF STREET-RAILWAY RULES.

BY M. C. ELLIS.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE "Rules Governing Conductors and Drivers," submitted by the special committee to the American Street-Railway Association at their recent convention, and published in full in the December JOURNAL, is an exhaustive treatment of the subject from a *general* point of view, but is not specific. We are told what is the best general policy for street-railway managers to pursue in dealing with their employés, and the proper conduct of the latter is outlined both with reference to their dealings with the company and with the traveling public. I, for one, and I presume I speak the wishes of a number of the JOURNAL'S readers, would have been glad if the intelligent gentlemen who had formed the committee had submitted what they deemed the best rules for observance in the form in which they should be submitted to the employés and known to the public. The difficulty hitherto has been that the public are not informed as to the rules of a street-railway, and are therefore ignorant as to whether or not a conductor or a driver is following out his instructions when on duty.

And again, rules are frequently established which are intended to be broken, and it is hard for the ordinary traveler upon our street-cars to know before making a complaint to a road of the conduct of its employé if the said employé has been acting contrary to instructions. It is most common—almost universal in fact—for a rule

to be prominently posted stating that no persons are allowed to ride on the car-platforms, and a half-a-dozen or more persons will be standing thereon directly in sight of this prohibitory notice. Similarly, nearly every street-car bears a prominently posted notice that no smoking will be allowed on the car, while the front platform, and oftentimes the rear platform, will be crowded with male passengers indulging in the habit. Of course, the conductors and drivers have been told what to do and obviously they have been informed that these rules are not to be rigidly observed; but how are the public to know that? and how is a passenger who is suffering in a crowded car from the fumes of tobacco to know that he has no right, under the company's rules, to request the conductor to prohibit the smoking?

These are but instances of the very lax rules that street-railways have adopted as regards the public conduct of conductors and drivers. It is highly likely that there are rules adopted by street-railway companies, unknown to the public, which are strict and rigid, and with which all their employés are expected to comply; but the public's confidence has not been sought and therefore there is little or no complaint made when these unknown rules are publicly broken.

If the street-railways would issue exact rules and regulations for employés in such concise form that they could be posted in each car directly before the eyes of the passengers, the traveling public would know where they stand and would know the precise rights and comforts to which they were entitled. As a result the employés would be enforced to obey these rules with greater exactitude than at present. The knowledge that the passengers were quite as well aware as they of what constituted a conductor's or a driver's proper duties, would greatly stimulate the latter to a proper observance of the rules. They would, as it were, find every passenger a species of employer's agent.

Therefore, while the rules and regulations submitted to the American Street-Railway Association are excellent and deserving of general adoption, they do not cover the ground entirely. What is wanted are a few brief, sensible regulations concerning the public conduct of conductors and drivers that may be comprehended and understood by the traveling public. There is no good reason that I can see why the public should not know the exact amount of discretionary power with which a conductor or driver is intrusted. When this is known, it will also be known just what is the duty of these functionaries in the emergencies which daily occur in our street-railway travel.

TRACK REPAIRS.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

THE Committee on track repairs submits the following:

Intelligent track repairing means not alone repairing; it means improvement. Realizing this, your committee has made a careful study of the more important factors of track-construction. In the name of the association it has called to its aid the experience, in particular, of those who had worn out their tracks. We have done this partly by circular, but principally (knowing the street-railway men's aversion to a letter) by personal application, to which end we made special arrangements.

We append a copy of the questions to which we solicited answers. Suffice it to say that they deal principally with the following subjects, which subjects we have used in the classification of the details of this report:

First, the rail; second, the stringer; third, the joint; fourth, the question of spread of track; fifth, the cross-tie.

We have gathered replies to our questions on these subjects from about one hundred and fifty companies, and have based our calculation on these replies.

1. THE RAIL.

We have endeavored to learn more from those who *have* worn than from those who *are* wearing out their tracks. We must, therefore, touch but slightly on the center-bearing type of rail unless later on, by comparison; because first, it is the newer rail of the two, and second, it has worn better and we have not so much to learn from it as to track defects.

Taking a general average we find that thirty-four companies have worn out a side-bearing rail averaging slightly less than 40 pounds per yard in 15.35 years. The rails were all of iron. Comparing the average wear of a light with a heavy rail we find as follows: Twenty companies averaging a 44½-pound rail wear it out in 16.25 years, whereas fourteen companies averaging a 30-pound rail wear it out in 14.07 years.

It is claimed, generally, by those urging the light rail that it will in their case give an average wear. That is to say the 30-pound rail used where the traffic is light will wear as long as the 44-pound rail where the traffic is medium to heavy. The statistics do not bear this out, and indicate that the use of the light rail has been pushed beyond economical limits.

We can, from the replies, gather two other points in connection with the rail: First, that the center-bearing type has proved more durable and far more satisfactory in the matter of track repairs, and second, that the use of steel is becoming universal. It is not necessary to wear a rail out to judge of its comparative life. The general experience with steel indicates that it is beyond doubt a very far more durable and economical material,

2. THE STRINGER.

We have looked into this in three ways. First, the average life of the stringer, regardless of the kind of timber or the nature of the paving; second, the average life of the stringer according to the kind of timber regardless of the paving; third, the average life of the stringer according to the kind of paving regardless of the timber.

1. The general average of life of stringers taken without regard to qualifications we find to be 8.9 years.

2. Classifying the stringers according to timber only, we find as follows:

A. Oak stringers average 8 years; B. Yellow pine stringers average 8.5 years; C. Spruce and hemlock stringers average 9.2 years.

It is regretted that the number of reports on oak stringers was not greater. We do not think the average given is thoroughly representative. It is believed that had we succeeded in getting fuller replies from those

using oak it would have been found more durable. In this surmise we are somewhat borne out by the investigation of T. B. Hough, given below:

INVESTIGATION INTO DURABILITY OF CROSS-TIES ON STEAM RAILROADS. BY T. B. HOUGH, FOR THE DEPARTMENT OF AGRICULTURE.

White Oak averaged	7.3 Years.
Post " "	7 "
Burr " "	7.4 "
Rock " "	7 "
Red " "	5 "
Chestnut Oak "	7.1 "
Black " "	4.5 "
Long leaf Southern Pine averaged	6½ "
Cedar averaged	11.8 "
(Red cedar outlived the white in the proportion of 11 to 7.)	
Cypress averaged	8.7 Years.
White Ash "	4.3 "
Black " "	3.8 "
Cherry "	6 to 10"

All woods more lasting when hewn than when sawn.

It will be seen that the white oak outlasted yellow pine as 7.3 to 6.5, both subject to similar conditions of wear.

3. Classifying the stringers according to kind of pavement only, we find:

A. In gravel and unpaved streets stringers averaged 8.75 years; B. In McAdam streets stringers averaged 8 years; C. In cobble-paved streets stringers averaged 9.6 years; D. In stone-block pavement stringers averaged 9.9 years.

While dealing in the main with averages there are many points of value indicated in the general nature of the replies that must not be ignored. Noticeable among which is the great variation that exists in the life of stringers with the different companies. It is a variation that is pointed no matter which way an analysis is made. For instance, we find that in unpaved or gravel streets the variation in life is from seven to ten years, in cobble pavements from five to twelve years, in block stone pavements from eight to twelve years, while in McAdam it seems more regular. We look for the cause of this in the varying conditions of the pavement, and we are inclined to assert that the *condition in which the pavement is kept* is to the street-railway man a more important factor than either the kind of timber or the class of pavement. We believe this point merits special and careful investigation.

It must be remembered that the above deductions are based upon worn-out tracks. From the replies will be gathered the fact that nine companies report pine stringers in the track for an average between them of fifteen years and still good.

In this connection we made a study of the rainfall from the United States Signal Service Reports. We could get no daylight. Not because it rained so hard, but because it followed no set rule. We found the question was less the amount of rainfall than the manner of the same. The difficulties of a proper comparison of the irregularities at the different points would have been too exhaustive for such a report as this.

In considering the question of stringers we have been fortunate in getting copies of some recent tests of the holding power of spikes on the yellow pine and white oak. We append the same:

TESTS OF HOLDING POWER OF RAILROAD SPIKES. BY CAMBRIA IRON COMPANY, JOHNSTOWN, PA.

MEASUREMENT RESISTANCE TO STARTING.

The same six spikes were used throughout, 5½ inches long, $\frac{9}{16}$ square. They were driven in the same distance each time viz.: 4¾ inches.

A.—In well-seasoned Yellow Pine (heart).

No. of Spike.	1st Time Driven.	2d Time Driven.
1	2,865 lbs.	2,275 lbs.
2	2,880 "	2,085 "
3	3,225 "	1,400 "
4	4,000 "	3,250 "
5	4,000 "	
Mean	3,394 "	2,252 "

B.—In well-seasoned White Oak (heart).

No. of Spike.	1st Time Driven.	2d Time Driven.
1	4,500 lbs.	4,000 lbs.
2	5,215 "	3,510 "
3	5,100 "	3,100 "
Mean	4,938 "	3,837 "

It will be seen that the resistance to starting was about one-half greater in the white oak, both in the first and second drivings. The superior holding power of the oak is also substantiated by such investigators as Funk, Von Weber and Von Raven.

For the above reasons we believe that in repairing stringers the white oak is the best timber to use. First, because of its durability, and second and most important, because of its greater holding power on the spikes; certainly a matter of prime importance with the stringer rail.

We are aware that in recommending the white oak we shall run counter to the accepted belief of many, but we are willing do so, feeling that if our course provokes a discussion and ventilation of the matter it will do more good than our error, if it *is* one, will do harm. We further recommend that special attention be paid to the condition of the pavement adjoining the stringer. When stone-block pavement is not in use the custom of paving immediately adjoining the stringer merits endorsement wherever the nature of the rest of the paving warrants it.

3. THE JOINTS.

As is well-known this is one of the items of largest and most constant expense.

The defective joint of the stringer rail is due to the flexible nature of the form and the consequent motion that finds its vent at the ends. There is but one way of meeting thoroughly this trouble which is to reduce the flexibility of the rail. To a certain point this has been done in the use, prevalent particularly in the east, of a very heavy rail, and so far as it has gone the improvement of the joint has been marked. The effort in this direction has gone as far, perhaps, as economical considerations will justify, and it is well to note that even in this case a defective joint is the result. We believe this exists with the very heaviest rails to an extent not generally realized. Careful measurements will show that on most of the lines in New York and Brooklyn the rails at the joints are wearing far more rapidly than elsewhere. The evil is not so much due to the yielding nature of the stringer at this point as is generally supposed. When the yield of the stringer is remedied by close attention and constant lining up of the joint-plates the wear immediately finds a new vent between the rail and the joint-plate. We have found in our investigations an instance wherein the end of the rail and the joint-plate had so worn that each had left its impress upon the other, the rail actually wearing into the plate. We take the broad stand that defective joints must be accepted as a necessary defect. It is the "social evil" of the street-railway system. But we further find that while it can not be entirely overcome it can be kept within bounds. There are two methods of im-

provement. One is to overcome as far as possible the motion at the joint ends of the rail by anchoring down to the stringers; the other is to bridge the ends with a false plate. Both have been intelligently experimented upon, and both have given promising results. We commend either plan as a large improvement upon the usual flat joint-plate dependent only upon the spikes.

4. SPREAD OF TRACK.

Replies on this point indicate two main causes. First, yielding of the stringers. In this case the rails of course go with them. Second, tendency of the rails to creep on the stringers. Twenty-one companies attribute spread of track to movement of the stringers. Nine companies to the movement of rails on the stringers. It will be noted that the first cause is more prevalent in towns of medium sizes, the second in the larger towns. We think this result is logical.

The stringers are apt to yield if not well supported by the surrounding pavement. In towns and cities of moderate size defectively kept up paving is a normal condition of affairs. In the larger cities, as a general thing, the paving is kept in better condition and the stringers less apt to yield. But, on the other hand, the street traffic is generally heavier, and where side-bearing rails are used the rails must pay the penalty. On the side-bearing rail are two lines of travel, car travel on the head and street-vehicle travel on the tram. Both tend to and do elongate the rail. If nearly evenly balanced the rail remains straight. If, as is the case ninety times out of a hundred, the travel of street-vehicles is in large excess, the tram will elongate at the expense of the head, resulting in a curve in the rail which tends to throw the joints out over the stringer. In such a case the track has the appearance of a series of bows or arches laid on their sides. In Philadelphia and New York the number of wagons and street-vehicles passing on the track compared with the number of cars by a test count is five to one.

It seems to be the general opinion that the use of good, substantial braces is preferable to the use of tie-rods. This seems intelligent in view of the fact that with the brace each stringer takes care of itself, while with the tie-rod it calls on its neighbor for help.

Neither tie-rod nor brace will overcome creeping of the rail. We believe there is but one remedy for this—the use of the center-bearing rail.

5. THE CROSS-TIE.

We believe the statistics gathered on this point can be regarded without reference to the condition of the pavement (unless when a very shallow stringer is employed) as the cross-ties are generally below its influence.

We note from the replies: First, average life of pine ties, 17 years; second, average life of oak ties, 15 years; third, average life of spruce and hemlock ties, 19 years.

The averages are based on ties that have worn out. There are a large number of companies still using ties reported good for many years after an average of 17 years' use.

We are at a loss to account for the great durability of the spruce and hemlock, which for want of larger averages we have classed together. It seems to apply to both stringers and ties. We hesitate to endorse the averages given in this case as thoroughly reliable, but as they are based on the replies received we place them on record.

In cross-tie lumber we think the prime requisite is the nature and quality of the timber. In cross-ties, to a greater extent than in the case of stringers, the disturbing element of the paving being absent, they stand more on their own merits.

We submit further that in view of the fact indicated by the replies, viz.: that the timber ordinarily used for ties will outlive two sets of stringers, and but few of them reach the life of three sets, one of two policies should be adopted.

First, to so carefully select the nature and quality of the tie timber as compared with that of the stringer as to secure a longer comparative life for the former, so that one set of ties shall safely reach the life of three sets of stringers. As the saving is to a greater extent a question of time and labor than the first cost of the ties, this point merits consideration.

Second, to accept the life of two sets of stringers as the duration of the ties and select such timber as will give the best track results in the interval. In this case the question is not one of quality of timber, but of the holding power of the spikes. Locality should determine which policy should rule. With well kept up pavements the first would give greater economy. With poorly kept up pavements the second.

It should be borne in mind that with poor pavements the tie becomes something more than a floating medium for the track. By means of the spikes and braces it has as much to do with holding the track to gauge as with holding it to surface. In the latter case, unquestionably white oak is the best timber. Indeed, it seems to us largely an open question whether the holding power of the timber on the spikes is not as important a factor in its value for street-railway construction as the difference in its average life. For instance, we have indicated a difference in the life of pine and oak stringers, taking our averages of 8½ years pine and 8 years oak, or about 6 per cent. in favor of the pine.

In the cross-ties we find 19 years pine against 15 years oak, a difference of say 13 per cent. in favor of pine. Whereas we find the spikes will hold at least 50 per cent. better in the oak. The question occurs which is the most valuable factor, an increase of 6 per cent. in the life of the timber or 50 per cent. in the holding power of the spikes.

The information given on the subject of cross-ties seems to bring to light another point of interest. It is noticeable that a special average taken for the light tram-rail used in conjunction with the shallow stringer gives an abnormally low life for the cross-ties. The average given is about ten years. It indicates that the shallow stringer brings the ties up into the influence of defective pavement. It has been shown that the light rail does not give its average of life; it is now indicated that the shallow stringer brings equally great evils into play. The deduction seems to be that if a projected new line, or the repairs of a light track, do not justify the construction of a substantially heavy road they will not justify the existence of a road at all. In other words, the light tram road is an absolutely more expensive track when measured by its life, even when subject to the normal traffic of small points.

APPENDIX.

THE RAIL-CONSTRUCTION.

The prevalence of the T-rail in almost all the southern cities, and its use in the suburbs of the larger points has made it a factor of no little interest to many street-railway men. As a rule, a rail that weighs from eighteen to twenty pounds is most used. From the replies we gathered that its average life does not exceed seven years. As might have been expected, when it is remembered that the heavier rails carry a larger percentage of metal in the head or wearing part, the life of a T-rail varies rapidly with the weight. As an extreme to the short life of the light rail may be taken the averages as given for the heavier T-rail used in the suburbs of such points as Cincinnati and Baltimore, and in the cities of Charleston, Savannah and Augusta.

The averages show 18 to 20 pound T-rail, 7 years; 20 to 25 pound T-rail, 9 years; 30 pounds and upwards, but slightly worn after an average of 7 years and in some cases good after over 16 years' use.

The cost of the rail is only part of that of the road, and is a smaller part than is generally considered by those who adopt it. We submit that the replacement of the light rail by one weighing not less than 30 pounds is one that will be the most economical.

The whole tenor of the statistics gathered seem to your committee to impress clearly one lesson, viz.: that in all street-railway work the best is the cheapest. The general use of steel as a material offers a striking contrast in its durability to the figures we have reached as to the average life of iron rails. It is not necessary to wear a rail out to judge of its economy—indeed the very fact that the steel has not worn out in many instances conveys the whole proof.

We go so far as to isolate street-railway repair and construction from the principles governing almost all ordinary construction, in asserting that the true principle of economy for street-railway work is to think of merit first and first cost afterwards. The substantial—cheaply as possible, but the substantial—cost what it may.

We call attention in closing that the averages deducted are not absolute *finally*—they *are* absolute *comparatively*, as will be clearly understood from the explanations given.

Compressed-Air Motors for Street-Railways.

ABOUT two years since, says the London (Eng.) *Times*, we described a system of air-driven tram-cars which was then about to be adopted on the Caledonian road line of the London Street-Tramway Company's system. This was the Mekarski system, and the car which was then experimented with was put on for regular traffic, and was worked on that road for about four months, taking its turn with the pair horse-cars. It was intended then to displace the whole of the horse-worked cars on this line by ten air-driven cars, but various delays occurred which prevented effect being given to the intention until the present time. Now, however, arrangements have been completed, and the first of the series of cars will very shortly be placed on the line for regular working, to be followed in due course by the other nine which are being built. Since our previous notice, however, several improvements have been introduced into the details of the air-engines, which are now made upon the compound principle. The high-pressure cylinder is 5¼ inches and the low-pressure 8 inches in diameter, with an 8-inch stroke, and through these the compressed air from the reservoirs is successively used. Means are provided by which the high-pressure air can be used in the low-pressure cylinder if necessary. The engine-house containing the air-compressing machinery is situated at the Holloway road end of the tramway line, where there are boilers, engines and pumps, by means of which atmospheric air is compressed, at a pressure of 450 pounds per square inch, into reservoirs placed in the engine-house. From these reservoirs the air is conveyed to the tram-car through charging-pipes with proper couplings, which are connected up for charging, and disconnected when the reservoirs on the car—which are placed underneath the platform—are charged to the necessary pressure. The principal feature of the system, however, is that the air in passing from the reservoirs on the tram-car to the cylinders in the engine is conducted through boiling water and steam at a pressure of 60 lbs. to the square inch, which is contained in what is known as a hot-pot. This hot-pot is charged at the compressing station while the car reservoirs are being filled with compressed air. By this means the heat which the air takes up during its passage through the hot water not only causes the air to expand but prevents the formation of snow in the cylinders and at the exhaust. The working pressure in the high-pressure cylinder ranges from 150 lbs. down to 50 lbs. per square inch, and can be varied at will. There are efficient brake arrangements, and all the other requirements of the Board of Trade have been amply met. The first of the series of cars for the Caledonian Road line was inspected recently at the Inventions Exhibition by a number of gentlemen interested in tramway locomotion. They were received by Capt. Clipperton on behalf of the company, and the construction of the engine and its working were explained by Mr. Harris, for Sir Frederick Bramwell, who is the engineer of the Mekarski Company, but who was unavoidably absent. The car was run to and fro on a short line in the south promenade of the exhibition, its working powers being satisfactorily demonstrated over such severe curves as could not occur in practice. We may add that the tram-cars upon the Mekarski system have been successfully working on the tramway lines at Nantes, in France, for the last six years.

New York Street-Railway Statistics.

COUNTING the annexed districts, New York City is about three-and-one-half miles wide and thirteen miles long, which necessitates many north and south means of transit. Those from Canal to Fifty-ninth street are inadequate. The success of the new Broadway line is an indication of the needs of the city. The capital stock of this corporation is $1,000,000, on a line only one and three-quarters of a mile long, and it has an indebtedness of $3,500,000. The stock is selling in the neighborhood of $1,000 per share.

The market price of the shares of a railway is a good indication of the intrinsic value of the property, especially in case of such stocks as surface railways. The Broadway

and Seventh avenue line, which is capitalized at $2,100,000 and has a bonded debt of $2,289,953, bearing 5 per cent. interest, pays 8 per cent. per year dividends and sells at $275 to 280. The line is eight miles long, and the equipment consists of 1,350 horses and 121 cars. In 1884 they carried 17,771,110 passengers, the gross earnings being $892,865 and the net earnings $253,921. The Central Park. North and East river road, with a capital of $1,800,000 and a debt of $1,225,567, owns thirteen miles of track, 1,223 horses, 161 cars, carried 15,849,982 passengers in 1884, netted $235,565 and paid 8 per cent. This company was chartered in 1860 and has been through the successive stage of scrip dividends. The Dry Dock, East Broadway and Battery road, with 11⅝ miles of track, 1,123 horses and 187 cars, carried 18,141,414 passengers in 1884, and netted $32,387, paying 13 per cent. dividends. The Eighth avenue line, capitalized at $1,000,000 and bonded as same, paid 14 per cent. on ten miles of road. The Forty-second and Grand street ferry line, 5.13 miles long, with a capital of $748,000 and a bonded debt paying 7 per cent., paid dividends of 18 per cent., the last quarterly dividend being 4 per cent. The Second avenue line, eight miles long, capitalized at $1,861,833, and bonded at $1,325,000, earned $327,144 net, and paid 10 per cent. dividends. The Sixth avenue line capitalized at $750,000, bonded at $1,250,000, four miles long, earned above operating expenses and fixed charges sufficient to pay dividends of $675,000, amounting to 90 per cent., and still carry to their surplus earnings the sum of $79,718. The Third avenue line is capitalized at $2,000,000, has a bonded indebtedness of $2,570,000, is 10½ miles long and paid 16 per cent. dividends in 1884.

Street-Cars in Paris.

THE street-car system of Paris is as nearly perfect as human ingenuity can make it. The cars run on T-irons about eight inches high, placed on concrete. This keeps them always even. Hence, riding on a Paris car is so noiseless that one can talk in a whisper, and you can read your paper without having your heart bounced into your hat every now and then. From the platform a steep stairway leads to the top, where sixteen people can find seats, an iron railing serving as protection. As soon as a passenger steps on the platform the fact is registered by the conductor. When every seat is full a sign, "complete," is turned down, and no more will be admitted. Hence, no one ever rides in a Paris car without a seat. It makes no difference whether you have been late, through following dear old Lamb's advice to digest your dreams, you have to wait. You may swear that your home is on fire or your bull-pup has the mumps. You will just have to wait. Of course, in such a case one of the 15,000 cabs in the city will soon accommodate you for 25 cents. The fare is six cents inside and three cents on top of the cars. Every half mile there is a station where the car stops. When the weather is bad the cars become quickly crowded, and you may see three or four of them go by with the tantalizing sign, "complete," hanging out. Then you go to the station and take a ticket with your number on it. When the car comes the conductors calls out, one, two, three, according to the number of places he has unoccupied. The remainder of the passengers have to wait for the next.

STREET-RAILWAY NOTES.

THE New York, Fordham and Bronx River Railway Company has been incorporated with a capital of $1,000,000, to build an elevated road on 138th street, Lincoln avenue and Third avenue, or Fordham avenue. It will cross the Harlem river from Second to Lincoln avenue, and from the grounds of St. John's College to the Bronx river it will be a surface road. Its length will be three miles.

AN electric railway on the Van De Poele system has been opened at South Bend, Ind. A single overhead wire transmits the current by means of a traveler; the tracks constitute the return circuit, brass strips being placed under the rail-strips to ensure a good circuit. There are two large Van De Poele dynamos run by water-power.

THE Consolidated Rapid Transit and Elevated Railroad Company, of Chicago, has been incorporated with a capital stock of $12,000,000. The purpose is stated to be to construct an elevated railway from the city of Chicago to Riverdale, South Chicago, Englewood, Washington Heights, Proviso and Norwood Park.

THE St. Paul (Minn.) Street-Railway Company will build an extension next year; 1,500 tons of steel rails have been ordered, which is said to be the largest order ever given for steel rails for a street-railway. The total expenditure for the extension will be $300,000.

THE Chicago Passenger Railway Company has approved a line on Adams and Harrison streets. Experiments will be made with the Hongman fireless motor, which is operated by soda, and has been successfully adopted in Europe.

THE Chicago and Western Dummy Railway has been sold at auction to F. W. Betz for $46,000. The purchaser represents parties unknown. The road extends from the western limits of Chicago to the Desplaines river.

THE Manufacturers' and Mechanics' Exhibition Building at Boston, which cost $400,000, was sold to the Metropolitan Horse-Railway Company for $300,000.

THE Capital City Street-Railway Company, of Montgomery, Ala., is making arrangements to substitute electric motors for mules.

THE Elkhardt Street-Railroad Company has been incorporated at Indianapolis, headed by William P. George. Capital, $50,000.

THE Menasha and Neenah Street-Railway Company, of Madison, Wis., has been incorporated with a capital stock of $25,000.

THE Enterprise Railroad Company, of Charleston, S. C., has decided to extend its tracks through a number of streets.

THE Central Electric Street-Railway projected for Washington, D. C., will be similar to the Baltimore line.

THE scheme of building a street-railway in Geneva, N. Y., has been under discussion lately.

THE new street-railway between St. Joseph, Mich., and Burton Harbor, is now in operation.

BIRMINGHAM, England, has decided to adopt the cable system for its street-railways.

IT is proposed to build a street-railway in Meriden, Conn.

New Inventions.

Skinner's Link-and-Pin Coupler and Uncoupler.

JOHN SKINNER, of Flint, Mich., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. It is the purpose of the invention to provide a simple, durable and efficient device which may be used as an automatic coupling, and by which the link may be held at any desired angle to enable it to be used upon cars having their draw-heads at different heights, the coupling-pin being upheld by a counterbalance which has pivotal connection with the draw-head.

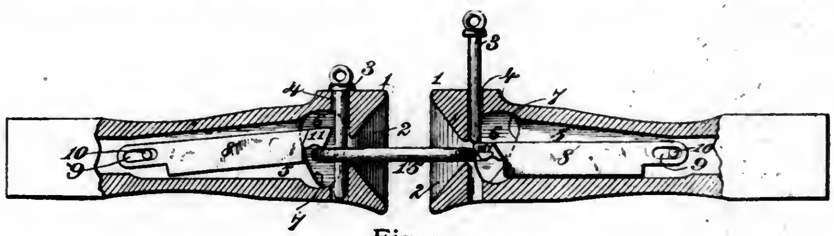


Fig. 1.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

In the accompanying cuts, Fig. 1 is a central longitudinal section taken vertically through two contiguous draw-heads provided with the invention; Fig. 2 a horizontal section taken longitudinally and substantially in a central plane, and Fig. 3 a detail perspective showing the construction of the pin-supporting device. Figs. 4 and 5 refer to a modification which will hereafter be described.

1 indicates the draw-head, which is provided with the flared opening 2, behind the coupling-pin 3, in a vertical opening 4. Running longitudinally through or nearly through the draw-head is formed an opening or chamber 5, having its forward end opening into an enlarged chamber or space 6, which is located just behind the pin 3. Upon each side of this chamber the walls thereof, which

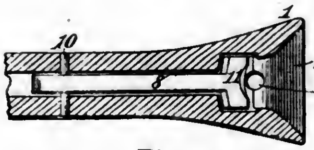


Fig. 2.

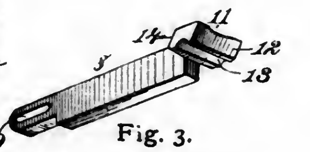


Fig. 3.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

are adjacent to the channel 5, are formed with curved and forwardly-inclined surfaces 7, for a purpose presently to be explained.

Within the channel or opening 5, is placed a bar 8, having at its rear a slot 9, through which passes a pivot-pin 10, set in the vertical walls of the opening 5. At its forward end the bar is provided with a cross-head 11, which lies in the chamber 6. This cross-head is beveled off in front at 12, and upon the lower surface is formed a transverse groove 13. The rear edges 14, lying upon each side of the bar, engage with the curved walls 7, of the chamber 6, and ride thereon as the cross-head moves up and down in the chamber. As the cross-head moves downward, it is evident that it will draw toward the front, thereby bringing its beveled edge toward the opening 2, and beneath the upper portion of the pin-opening 4. The bar 8, is formed of metal, and is of such dimensions as to give it the required strength and weight. The link 15, which is inserted through the opening 2, and rests upon the lower shoulder 16, of the same, has its end lying in the groove or channel 13, the weight of the bar 8, and its cross-head, being sufficient to counterbalance the outer end of the link and support it in whatever position it may be placed.

In coupling, the link being thus arranged in one draw-head, the coupling-pin 3, is placed in the other, with its point resting upon the beveled edge of the cross-head 11, the latter being drawn forward by the inclined walls 7, in the manner already described. The entrance of the link 15, pushes back the cross-head, the slotted end of the bar slipping upon the pin 10. This permits the descent of the pin, which drops through the loop of the link, thus accomplishing the coupling. The cross-head 11, being beveled off at 12, as already described, permits the end of the link to pass underneath and beyond the end of the

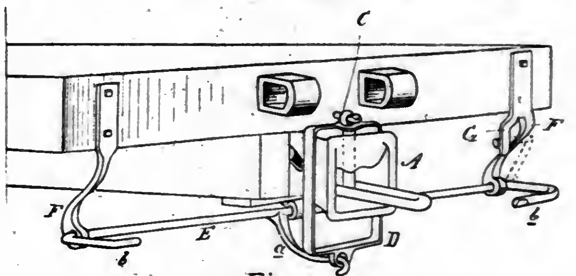


Fig. 4.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

pin before the latter drops off the cross-head, as it will be seen that the push of the coupling-link will cause the cross-head to ride upward upon the curved walls 7, for a short distance before it passes from beneath the pin. By this invention the link may be placed in any suitable position for coupling and retained in that position. As the draw-heads upon different cars are often arranged at different heights from the ground, it is often necessary to incline the link upward or downward to enable it to

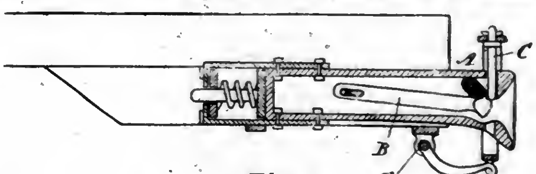


Fig. 5.

SKINNER'S LINK-AND-PIN COUPLER AND UNCOUPLER.

enter the opposite draw-head. In whichever position placed, the weight of the bar 8, and cross-head 11, will hold the parts in the proper position until the coupling is accomplished.

In Figs. 4 and 5 is shown a modification of the device,

by means of which a coupling-pin can be raised, so as to allow of the easy withdrawal of the link, while it can be readily held in its elevated position to prevent coupling. Fig. 4 is a perspective view showing the application of this modified device, and Fig. 5 a vertical longitudinal section through the coupling.

A represents a draw-head, B a gravity-pin, and C a coupling-pin, as before described, and D is a yoke, rectangular in form, placed around the draw-head, as shown.

The upper horizontal bar of the yoke P, is removably secured to the head of the pin C, while the lower horizontal bar is pivotally secured to the arm *a*, which projects outwardly from the rock-shaft E, which is properly journaled in the ends of the brackets or hangers F, as shown, the outer ends of the rock-shaft being bent to form handles *b*. Upon one or both of the brackets F, and preferably forming an integral part thereof, is the stop G.

It is claimed for this device that it obviates the necessity of a train-hand going between the cars to couple or uncouple; that the pin may be controlled from either side, or top of the car; that it operates by gravitation, no springs, gears or fixtures being employed, and that the entire device is simple, inexpensive, efficient in operation and not liable to derangement.

The device is now controlled by the Skinner Car-Coupler Company, of Flint, Mich.

Hayes' Nut-Lock.

JOSEPH HAYES, of Dover, N. H., is the inventor of an improved nut-lock, which is herewith illustrated and described. This nut-lock is designed to be affixed to the fish-plates of two railway-rails, the screw-bolt going through them and the clasp of the nut-lock, and such clasp at its lower edge being in contact with the bottom flange of the rail or that of the fish-plate, whereby it is prevented from revolving on the bolt.

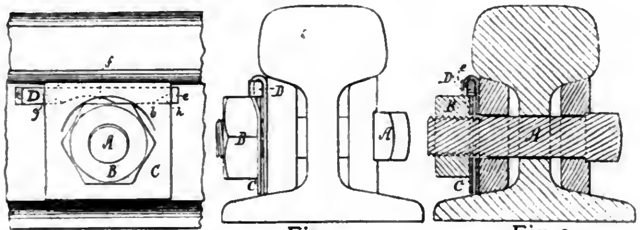


Fig. 1. Fig. 2. Fig. 3.

HAYES' NUT-LOCK.

In the accompanying cuts, Fig. 1 is a front elevation; Fig. 2 an end view, and Fig. 3 a vertical and median section of a nut-lock employing the invention; Fig. 4 a top view, and Fig. 5 a side view, of the key of such lock; Fig. 6 a front view, and Fig. 7 a transverse section of one form of the clasp of such lock, while Fig. 8 is a front view and Fig. 9 an end view of another form of the clasp. Fig. 10 is a view of the clasp shown in Fig. 6 before it is folded at its middle. Fig. 11 is a perspective view of the clasp with the bolt or lock open so that the nut can be turned, and Fig. 12 a similar view of the clasp with the bolt locked.

A is the screw-bolt, and B its nut, the shank of the bolt going through the clasp C. This clasp consists of a rectangular plate, one-half of which is folded at the middle of the plate over the other half, a hole *a*, for the reception of the shank of the bolt being made through each half. In the front half of the clasp there is an arcal slit *b*, which is above and concentric with the hole *a*. The segment of such slit is pressed in or downward against the rear half of the clasp, and is truncated in its upper part, as shown at *c*. A key D, is arranged in the upper part of the clasp, and between its two holders, and directly over and resting upon the top of the truncated segment *d*. This key slides lengthwise to it in the clasp, and is flanged at each end, as shown at

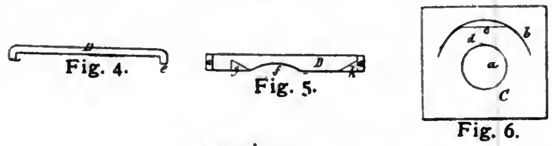


Fig. 4. Fig. 5. Fig. 6.

HAYES' NUT-LOCK.

e, to limit the movement of the key either way. Furthermore, the key at its middle has in it a segmental notch *f*, as shown, whose radius corresponds to that of the slit *b*. It also has two beveled notches *g h*, arranged in it as represented.

On the nut being screwed hard up against the clasp, so

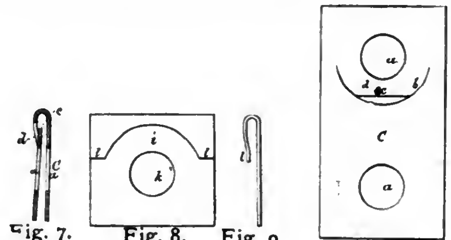


Fig. 7. Fig. 8. Fig. 9. Fig. 10.

HAYES' NUT-LOCK.

as to bring one side of such nut level with the straight portion of the top of the truncated segment, (the arcal slit having a radius a little greater than the extreme radius of the nut) the key can be moved in the clasp, so as to project over the upper face of the nut in a manner to prevent the nut from revolving on the screw, it being understood that the key is thicker than the plate of which

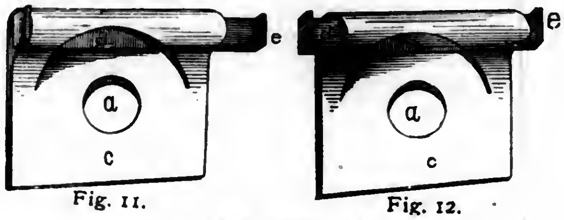


Fig. 11. Fig. 12.

HAYES' NUT-LOCK.

the clasp is made. On the key being thus on the nut, the first half or part of the clasp is to be hammered down so as to enter the notches *g* and *h*, and thereby hold the key from slipping back from locking the nut.

The clasp when formed as shown in Figs. 8 and 9—viz.: as folded near its upper edge, and having an arcal recess *i*, in it, as shown, concentric with the bolt-hole *k*—can be used with the key and the bolt and nut, the parts *l l*, being forced into the notches of the key to hold the key from being accidentally set or moved back.

It is claimed by the inventor that this form of nut-lock

is simple, durable and efficient. It can be applied to the rails of any railway without the necessity of structural changes; it does not require the nut to be turned to an exact angle and it cannot be accidentally deranged. It also serves as a washer.

Raddin's Car-Coupling.

JOHN RADDIN, of Lynn, Mass., is the inventor of an automatic safety car-coupling, which is herewith illustrated and described. Fig. 1 is a vertical longitudinal section of the draw-bar with the pin-and-link in position, and Fig. 2 a vertical section of the same, the pin being held up and the link out.

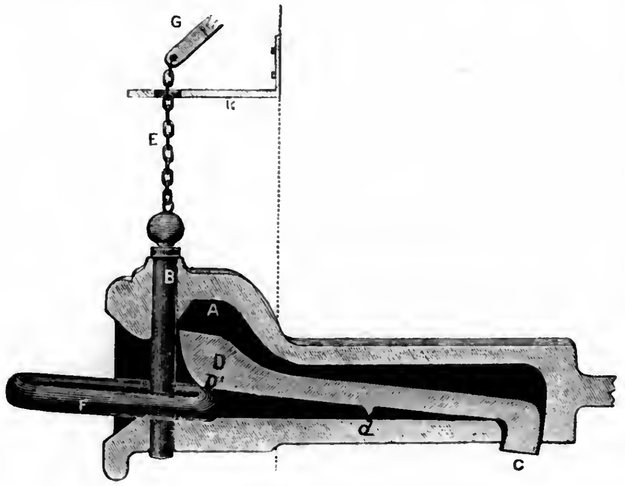


Fig. 1.
RADDIN'S CAR-COUPLING.

A represents the draw-bar, the mouth of which is made in the ordinary manner; but the recess back of the pin is enlarged so as to receive the lever-weight D. This lever-weight D, is pivoted at *d*. The front end of the lever-weight D, is hollowed out and curved, as shown.

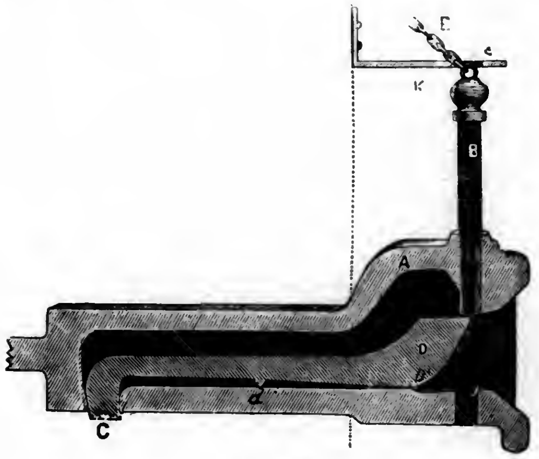


Fig. 2.
RADDIN'S CAR-COUPLING.

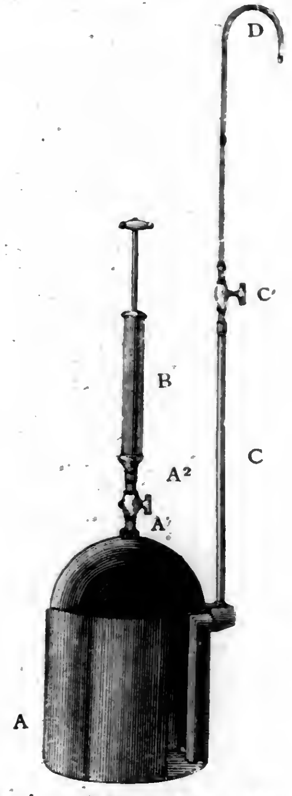
The part D', of the lever-weight, is adapted to rest upon the end of the link F, and hold it, as shown in Fig. 1. When the link is out, the lever-weight D, falls, as shown in Fig. 2, so that the front end projects forward far enough to receive the end of the pin B, and hold it up; but when the link F, enters it will throw up the lever-weight D, so that its end will pass out from under the pin and allow it to drop.

It is claimed by the inventor that his device forms a simple, durable and efficient coupling; that it is automatic in its action, and that going between the cars is avoided; that it is unvarying in its action, and inexpensive in construction and application; that cars furnished with the coupling will couple with cars not so furnished, either on a grade or level, or on a straight or curved track. A device may also be arranged whereby the cars can be uncoupled from either their tops or sides.

The coupling is now in successful use on a number of cars on the Boston and Maine Railroad.

Andrews' Long-Distance Lubricator.

HARRISON A. ANDREWS, of Conneaut, O., is the inventor of a long-distance lubricator, which is herewith illustrated and described. The device is intended to be used in lubricating line-shafts and other machinery that cannot be easily reached, and the inventor has also provided a form of the device especially applicable for oiling distant



ANDREWS' LONG-DISTANCE LUBRICATOR.

parts of a locomotive and car-axles on long runs at high speed. The accompanying cut is a view of this form of the device with the lower part of the reservoir broken away.

A is a reservoir, of any desired form, and of suitable size to be easily handled, and is provided with a nipple A', having an inlet-port, within which is located a stop-cock A². To the nipple A, is attached an air-pump B, by which air is forced into the reservoir. The reservoir is provided with an outlet-pipe C, arranged preferably near its upper end, and provided with a stop-cock C', and adapted to support a pipe of sufficient length to reach

the places to be oiled. A discharge-pipe or nozzle D, is attached to the outlet-pipe, and is bent downward over each shaft, so as to discharge the oil into the cups, holes, or gearing. Air is forced into the reservoir until the pressure is sufficient to force the oil through the pipe to the shaft. The flow is regulated by the stop-cock C′.

A stop-cock is placed between the air-pump and the reservoir, which may be closed and the pump removed entirely during usage, the pressure of the air remaining nearly the same. The reservoir A, is made of one piece of metal, and has a dome-shaped top, which terminates in the nipple A′, which performs the double office of a valve-seat for the stop-cock or plug-valve A^2, and a means of attachment for the pump-barrel. The lateral outlet-pipe C, is also integrally formed with the body of the reservoir, and serves as a means of attachment for the discharge-pipe D.

As the delivery pipe can be bent or constructed in any form and extended to any distance, the lubrirator is especially adapted for all places difficult of access or dangerous to reach by ordinary lubricators. The device is contructed entirely of brass and in the most substantial manner.

By means of this construction and arrangement of parts the inventor claims that he has provided a lubricating device which is free from the complication of parts which is found in ordinary lubricators.

Whitmore's Car-Coupling.

JOHN WHITMORE, of Salem, Mass., is the inventor of a new form of car-coupling, which is herewith illustrated and described. The invention relates to that class of automatic car-couplings in which the coupling-pin when not in use is supported by spring-jaws that are adapted to be opened or spread apart by the entering link, so as to cause the pin to drop into engagement with the link, thereby coupling the opposite draw-bars, without any necessity of going between the cars, either to drop the pin or hold the link. Heretofore in couplings of this

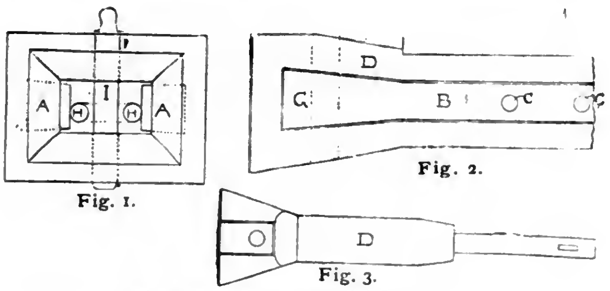


Fig. 1. Fig. 2. Fig. 3.

WHITMORE'S CAR-COUPLING.

class the spring-jaws have been provided with longitudinal V-shaped grooves to receive and hold the link in a horizontal position; but the V-shaped grooves are liable to interfere with the necessary vertical inclination of the link in coupling cars that differ materially in height. To overcome this difficulty and provide as well for guiding the link into place, and also for its vertical inclination in coupling cars of different heights and its necessary lateral inclination and play while the cars are in motion, the inventor makes the pin-supporting jaws wedge-shaped and with continuous vertical surfaces at their meeting edges without grooves or recesses. By this means a wedge-shaped opening is presented toward the mouth of the draw-head, whereby the link is surely guided to its place without regard to varying elevations of the draw-bars. The continuous vertical meeting edges of the jaws permit the link to have any required vertical inclination, and the spaces at the front and rear of the wedge-shaped jaws allow the necessary lateral inclination or play of the link in turning curves.

In the accompanying cuts, Fig. 1 is an end view of the improved car-coupling; Fig. 2 a side view of the draw-bar; Fig. 3 a plan of the same; Fig. 4 a horizontal longitudinal section, and Fig. 5 a vertical longitudinal section of the draw-bar, showing the coupling-pin supported by the spring-jaws.

The draw-bar D, is made with a flaring mouth M, as usual, and is cored on each side at E E, to admit of the lateral yielding movement of the wedge-shaped jaws A A, which are formed on or attached to spring-arms B B, that are secured to the sides of the draw-bar by means of bolts or rivets C C, or otherwise. The jaws A, and springs B,

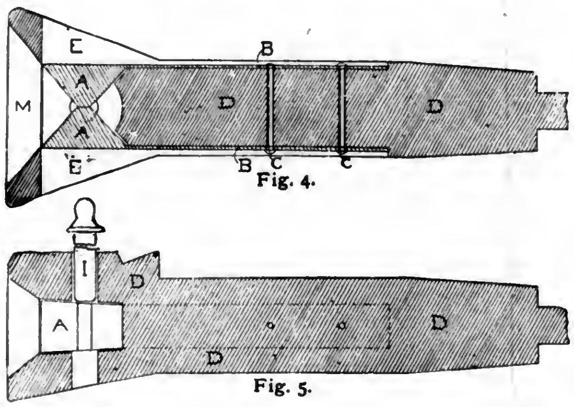


Fig. 4. Fig. 5.

WHITMORE'S CAR-COUPLING.

are preferably made of steel. It will be seen that the two opposite wedge-shaped jaws A A, are so arranged that the force of the springs B B, will keep the edges of the jaws in contact, thus forming a support for the coupling-pin I, until the entrance of the link H, spreads the jaws apart, thereby causing the coupling-pin to fall into engagement with the link, as shown in Fig. 1.

The vertical meeting edges of the wedge-shaped jaws are formed without grooves or recesses of any kind, and in such a manner that the jaws will be in contact with each other throughout the length of the edges when the link is withdrawn. These continuously-vertical meeting edges of the yielding jaws A, enable the link H, to assume and maintain any required vertical inclination, to accommodate itself to inequalities in the height of the opposing draw-bars. It will also be observed that the wedge-shaped spaces in the draw-bar at the front and rear of the wedge-shaped jaws permit the link to turn freely in a horizontal direction between the yielding jaws to any required inclination in turning curves, while the wedge-shaped space or opening in front of the jaws insures a proper guiding of the link into place when the draw-bars are brought together in the act of coupling.

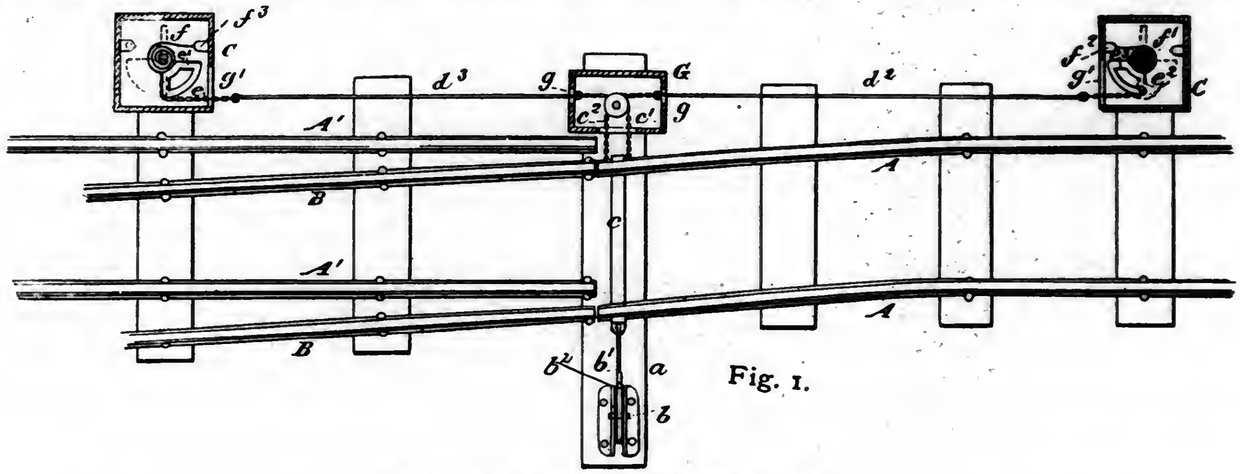
This form of coupling is claimed by the inventor to be simple, durable, and efficient, and not liable to injury or derangement.

Wilkinson's Automatic Switch-Signals.

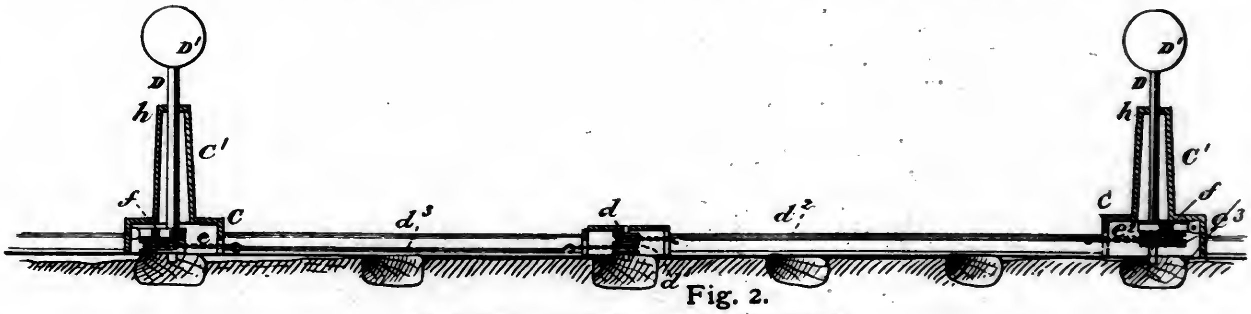
ALGERNON L. WILKINSON, of Huntsville, Ala., is the inventor of two improved automatic switch-signals for railways, which are herewith illustrated and described. In the accompanying cuts, Figs. 1 and 2 refer to the first device, and Figs. 3 to 10, inclusive, to the second.

The object of the first device is to warn the engineer on approaching trains of an open switch, or that the switch is turned to register the rails of the main line with the rails of the siding, and to display the danger-signals at the proper height from the ground and at such a distance from the switch in opposite directions that the approaching train may be brought to a stop before reaching the switch. Another object is so to connect the signals with the rails that they cannot be moved to the siding without displaying the danger-signals.

Fig. 1 is a plan view of this device, certain parts being shown in section and the rails of the main line being represented as registering with the side rails, and Fig. 2 a vertical sectional view of the same, showing the signal-shafts in position to indicate the main track clear.



WILKINSON'S AUTOMATIC SWITCH-SIGNALS.



WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

A and A′ represent the main line rails of a railway-track, and B the side rails. An ordinary switch-frame *b*, having a pivoted switch-bar b^2, is secured to one end of the long tie *a*, in the usual manner. A cross-bar *c*, is secured to the under side of the rails A, near their ends, and a connecting-rod b', connects the lower end of the bar b^2, with the cross-bar *c*. A box G, is secured to the outer end of the tie *a*, within which are pivoted, one above the other on the same bolt or shaft, two pulleys *d* and d'. Two chains c' and c^2, are attached to a rail A, at or about the outer end of the bar *c*, these chains passing into the box G, about the pulleys *d* and d', in opposite directions, and being severally connected with rods d^2 and d^3, as shown. The outer and further ends of the rods d^3 and d^2, are severally connected by chains *e* and e^2, with angular plates e' and e^3, made fast to the vertical shafts which hold the signal-plates, the latter being usually colored white on one side and red on the other for readily distinguishing them.

D indicates the vertical shafts holding the signal-plates D′, each of these shafts resting in a socket in a tie, on which rests the casing C, or in a socket in the bottom of the casing. Each of the plates e' and e^3, is triangular in form, (except that its outer edge forms the segments of a circle) and is rigidly attached at its inward angle or corner to the signal-shaft D, the outer or curved edge of the plate being grooved to receive a chain connecting one corner of the plate with the rod extending to the box G, as seen in Fig. 1. A coiled spring *f f′*, is attached to each of the signal-shafts D, and also to the casing C, in such a manner as to turn the shaft against the tension of the rods d^3 and d^2, when the rails A, are shifted to register with the side rails. The casings C, having reduced upward extensions C′, inclose severally the lower part of each signal-shaft and attachments, as shown, the shaft extending through an aperture in the top, and the casing having an aperture for the connecting-chain, so that the parts inclosed are properly protected from the weather and from being injured or having their operation obstructed.

The operation is as follows: When the operator, through the switch-bar b^2, and bar *c*, moves the rails A, to register with the side rails, the rods and chains connecting the rails A, with the angular plates on the signal-shafts are drawn and

turn the shafts, so that the signal-plates are turned from their position in line with the main line of rails to positions at right angles thereto. When the switch-rails are moved back to register with the rails of the main line, the signals D′, are immediately returned to their first positions by the springs f and f', acting on the shafts D, and turning the same, the plates e' and e^3, moving with the shafts and drawing the connecting-chains, the parts of which next to the angular plates sink in the grooves and are held in proper position. The simple construction of the shafts with grooved angular plates and actuating-springs f and f', renders the operation of the device more prompt and certain.

switch. The case C, is free to turn upon the stud c, and serve as a drum upon which the chains leading to the signals may be wound. C^2 represents a flat bar of metal placed above the revolving case C, and connected to the cross-tie by bolts or rods c^3, as shown. The upper end of the stud c, passes through and is supported by the plate C^2. D represents a drum loosely mounted upon the stud c, within the case C. E represents a coiled spring placed within the case C, near the top thereof, and connected at its opposite ends to the drum D, and the box or case C. F represents flat open-linked chains, one end of each of which is connected to the drum D, upon opposite sides thereof, as shown. The chains F, pass outwardly through

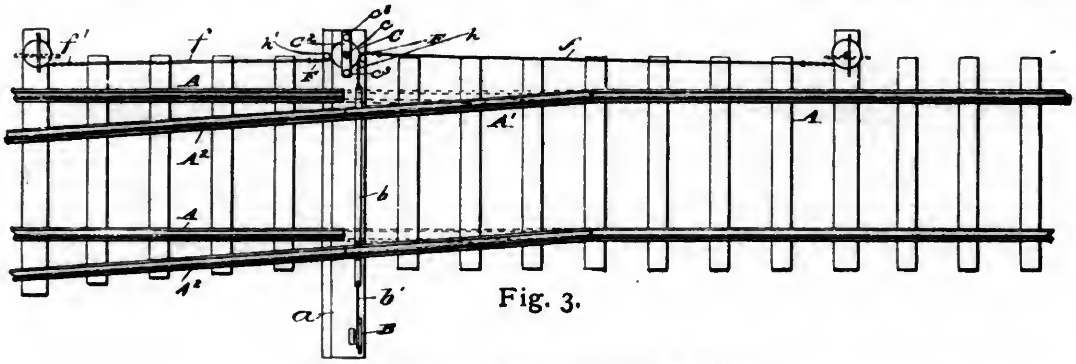


Fig. 3.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

Figs. 3 to 10, inclusive, of the accompanying cuts refer to the second device. The general object of this invention is to connect the signals with the switch in such a manner that any movement of the latter, either by design or accident, will serve to set the signal; and its special object is the provision of means whereby expansion and contraction, incident to changes of temperature, of the rods or wires which connect the signals, their operating devices and the switch, is overcome, and all danger arising from the possibility of the signals becoming set, displayed, damaged, or inoperative through the expansion or contraction of the connecting rods or wires is avoided.

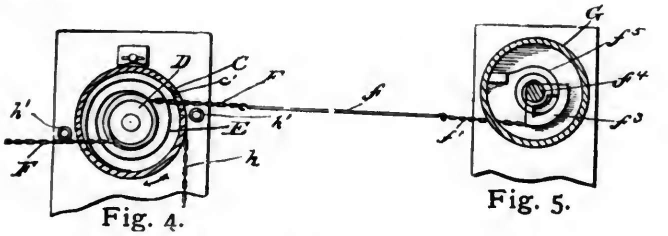


Fig. 4. Fig. 5.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

Fig. 3 is a plan view of a portion of a railway provided with this improved device; Figs. 4 to 7, and Fig. 9 are detached detail views of parts of the improvement; Fig. 8 shows a modification, and Fig. 10 is an enlarged detail view of parts of the invention.

A represents the track of the main line of a railway, and A′ a switch connecting such main line with a side track A^2. The switch A′, is provided with a switch-lever B, connected by means of a rod or link b', to the bar b, which holds the switch-rails at proper distance apart. C represents a circular box or case, formed of metal and mounted upon a stud c, projecting upwardly from one end of the cross-tie a, which supports the sliding or free end of the

apertures c', formed in the case C, at opposite sides thereof, and are connected to one end of the signal wires or rods f. The opposite ends of the rods or wires f, are connected by chains f', to a segment f^3, secured to the lower end of the signal-supporting shaft f^4, to the top of which shaft the signal is attached. The signal proper is normally kept in the same plane as the rails by a coiled spring f^5, attached to the lower end of the shaft within

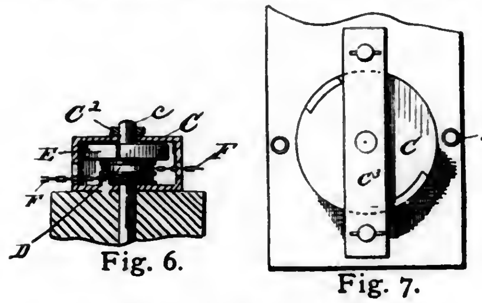


Fig. 6. Fig. 7.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

the inclosing-case G, which is of metal, preferably circular in cross-section, and holds the segments f^3, and coiled spring f^5. The signal-shaft passes downwardly through the case and into the cross-tie below, while the chains f', pass through the side of the case to the rods f. The construction of the device attached to the signal-shaft are similar to those shown in the first-described switch-signal, and operate in a similar manner. The case C, is rotated by a chain h, one end of which is connected to the case, the opposite end being secured to the free end of the switch, whereby when the switch is moved, the case C, will be drawn around and serve first to engage the V-shaped notches c', with the chains and then to wind the chains F, upon its outer surface, in which operation the case C, will be aided by small chain-rollers h', mounted upon studs projecting upwardly from the tie at

each side of the case, and about which rollers the chains pass. The rotation of the case draws upon the chains F, and rods *f*, and thereby turns the signal-shaft and displays the signal attached thereto, as will be readily understood. When the switch is in its normal closed position—*i. e.*, registering with the main line—the rods or wires *f*, and chains F, pass in a direct line from the drum

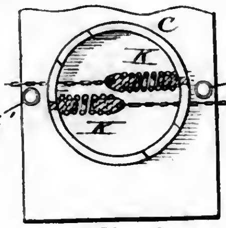


Fig. 8.

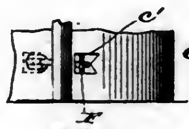


Fig. 9.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

D, to the segment upon the signal-shaft, as shown in Figs. 4 and 5, in which position the chain F, does not touch the side walls of the aperture *c'*, in the case C, through which it passes, and can therefore pass freely in and out through the aperture; and inasmuch as the coiled spring E, connecting the drum D, to the case C, is weaker than the coiled springs f^5, upon the signal-shaft, it follows that any expansion of the rods or wires *f*, will turn the drum D, without turning the signal-shaft.

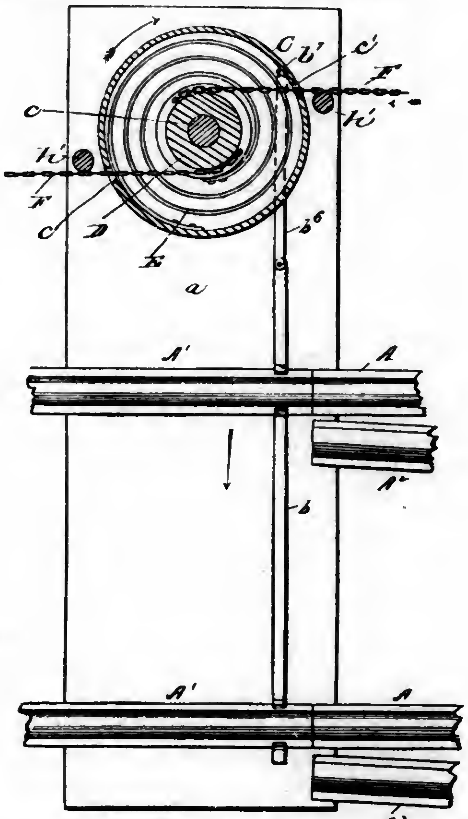


Fig. 10.

WILKINSON'S AUTOMATIC SWITCH-SIGNALS.

To lock the chains F, to the case C, when it is desired to rotate the latter, the following means are employed: One of the side walls of the aperture *c*, through which the chain passes, is made V-shaped, (see Fig. 9) and although the chain, when the case C, is in its normal position, passes freely in and out of the aperture, yet, when the case is rotated in the direction of the arrow, (see Fig. 9) the V-shaped side wall of the aperture *c'*, takes into one of the links of the chain as it passes about the roller *h'*, and thus holds it firmly clamped in position to be wound upon the outer surface of the case C. The clamping of the chain F, by the V-shaped side wall of the aperture *c'*, is shown by dotted lines in Fig. 9. In lieu of the drum D, and coiled spring E, the chains F, may be attached to spiral springs K, located within and attached to the side walls of the case C, as shown in Fig. 8.

The apertures *c'*, in the side walls of the case C, shown in Fig. 8, are similar to those shown in the walls of the case C, in Figs. 4 and 6, the chain being held and clamped in a similar manner. Backward rotation of the case C, to its normal position when the switch is returned to the main line is caused by the spring f^5, attached to the signal-shaft, as will be readily understood. If desired, however, such backward rotation of the case may be caused by a rigid connection between the rail-coupling link *b'*, and the case, as shown in Fig. 10, in which the link *b'*, is connected by a rod b^6, with a crank-pin b^7, projecting from the lower surface of the case C, near one of its side edges. In lieu of the device here shown, a rack-bar may take the place of the rod b^6, the teeth of which engage with a gear-pinion secured to the lower surface of the case.

The inventor claims for both of his devices the merits of simplicity and reliability.

Pflaum's Metallic Piston-Packing.

NICHOLAS PFLAUM, of Port Jervis, N. Y., is the inventor of an improved metallic piston-packing, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a plan view, partly in section, of one of the improved piston-packings; Fig. 2 a side elevation of the same, part being broken away, and showing a part

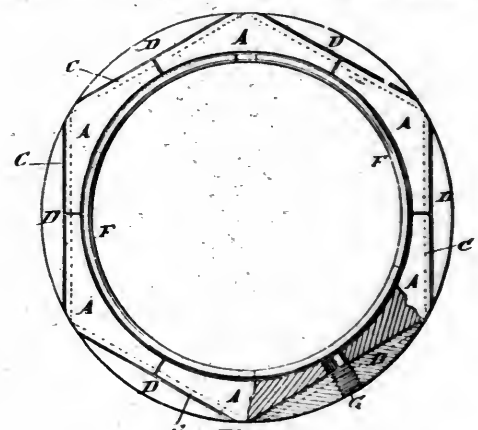


Fig. 1.

PFLAUM'S METALLIC PISTON-PACKING.

of the cylinder in section; Fig. 3 a perspective view of one of the exterior segments, and Fig. 4 a perspective view of one of the interior angular blocks.

A represents the interior blocks, the exterior faces of which are angular, and have their apices rounded off upon the arc of the circle of the interior surface of the cylinder B, in which the packing is to be placed. In the central parts of the outer faces of the angular blocks A, are formed grooves C, as shown in full lines in Figs. 2 and 4, and in dotted lines in Fig. 1. The interior faces of

the angular blocks A, are concaved upon the arc of a circle, as shown in Figs. 1 and 4.

D are plane convex segments, upon the central parts of the plane inner surfaces of which are formed tongues E, of such a shape and size as to fit into the grooves C, of the angular blocks B. The outer faces of the segments D, are convexed upon the arc of the circle of the interior surface of the cylinder B, in which the packing is to be placed, The packing is hèld out against the inner surface of the cylinder by open ring-springs F, placed within the packing, as shown in Figs. 1 and 2. With this con-

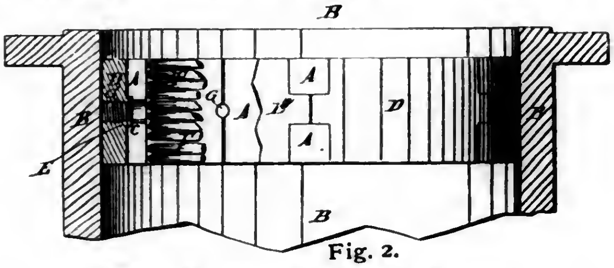


Fig. 2.

PFLAUM'S METALLIC PISTON-PACKING.

struction the outer surface of the packing as it wears will always retain its circular form, and will thus always remain in close contact with the inner surface of the cylinder. Through the centers of the segments D, are formed radial perforations G, which are extended through the adjacent ends of the angular segment A, as shown in Figs. 1 and 2.

The packing, when in use, is secured between the piston-head and the follower in the ordinary manner, and which close up the opposite sides of the packing and form a chamber. The interior of the piston-packing A D, is designed to be filled with tallow, which is slowly melted by the heat, and gradually escapes through the perfora-

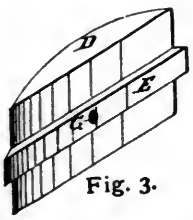


Fig. 3.

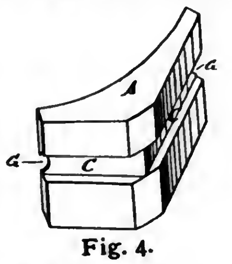


Fig. 4.

PFLAUM'S METALLIC PISTON-PACKING.

tions G, so that the inner surface of the cylinder will be kept lubricated. The piston-head and follower are not shown in the cuts, as there is nothing new in their construction.

This form of packing is claimed by the inventor to be simple, durable and economical. It has been subjected to thorough tests and found satisfactory.

George N. Veritzan, of 223 Bowery, is the New York agent for the device.

Buckman's Car-Coupling.

THOMAS E. BUCKMAN, of Jacksonville, Fla., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. In the accompanying cuts, Fig. 1 is a longitudinal sectional elevation of the coupling in the position which it has when the cars are coupled; Fig. 2 a similar view showing it in position ready for coupling; Fig. 3 a plan view of the same, and Fig. 4 a plan view of the link.

The draw-head A, is provided with a stem B, projecting from its rear end and running through the plates K and D, and the spring C, the stem also passing through a cross-piece E, uniting two side pieces F, between which the cross-piece D, is held. The cross-piece E, has side-pieces E′, against the front ends of which the cross-piece D, can strike. A key B′, is passed through the stem B, behind the cross-piece D, and a key B^2, is passed through the stem B, at the rear end of the same. The key B^2, prevents the stem being drawn entirely through the cross-piece E, to the front, and the key B′, takes up the forward draft. The bottom edges of the side-pieces F, are inclined downward toward the front end of the draw-head, and the side-pieces are united by a cross-piece G, secured

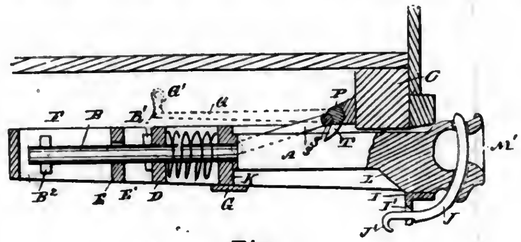


Fig. 1.

BUCKMAN'S CAR-COUPLING.

to the bottom edges to hold up the rear end of the draw-head and resist the downward thrust of the link-frame S. On the under side of the front ends of the side-pieces E, is bolted a flat cross-piece H, having a downwardly-projecting flange I, with an aperture I′, through which the hook J′, on the lower inner end of the curved coupling-pin J, is passed. The draw-head A, is provided with a bevel L, on its bottom edge near the front end. The draw-head also has a cavity M′, for receiving the link N, and a slightly-curved pin-aperture M, extending from top to bottom.

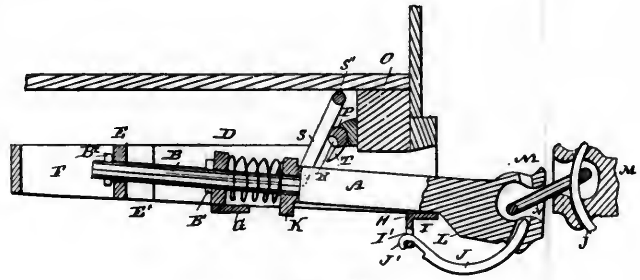


Fig. 2.

BUCKMAN'S CAR-COUPLING.

O is the front end beam of the car, and the distance from the bottom edge of this beam to the cross-piece H, is equal to the height or thickness of the draw-head directly in front of the bevel L. A rock-shaft P, is journaled on the under side of the car, and is provided at the ends which are at the sides of the car with levers Q, which can be held or locked in place when lowered by latches Q′, pivoted on the sides of the car. The rock-shaft has a longitudinal groove R, for receiving the forward end of a rectangular link or frame S, which has its rear end pivoted in the rear end of the draw-head and presses against the draw-spring plate K. The rock-shaft has a cam-arm T, which can act on the frame S.

The operation is as follows: When the car is coupled,

the front part of the draw-head rests on the cross-piece I, the pin J, is passed up through the draw-head and holds the link N, the forward end part S′, of the locking-link S, being in the groove R, of the rock-shaft P, and prevents pulling the draw-head outward.

When it is desired to uncouple, the handle Q, is swung up to turn the rock-shaft P, in such a manner as to cause the cam T, to strike the front end of the frame S, and swing the same upward, thereby releasing the draw-head,

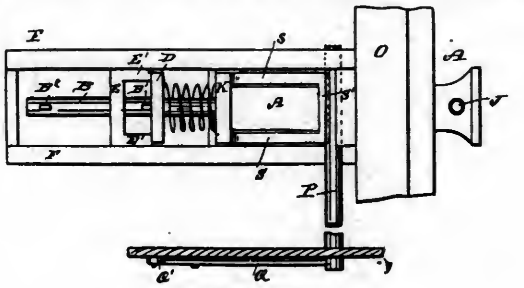


Fig. 3.
BUCKMAN'S CAR-COUPLING.

which can be pulled out a certain distance by the strain on the link. The bevel L, slides down the cross-piece H, the front end of the draw-head descends, and the pin J, swings down and releases the link N. When the cars couple, the draw-head A, is forced inward and upward by the opposing draw-head, the bevel L, sliding up the cross-piece H, whereby the pin J, is swung up and through the draw-head and link. The draw-head is pushed back

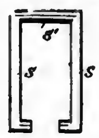


Fig. 4.
BUCKMAN'S CAR-COUPLING.

so far that the cross-piece S′, can drop into the groove R, and thus lock the draw-head in place.

The inventor claims this form of coupling to be automatic in its action in coupling, that it couples to varying heights of draw-heads, and that it uncouples under strain on the link and without the necessity of backing the engine.

Gouilloud & Page's Journal-Bearing.

Louis Gouilloud and Charles Page, of Montreal, Canada, are the inventors of an improved journal-bearing, which is herewith illustrated and described. The device is applicable to the rolling-stock of railways, including freight and passenger-cars, sleepers, and the tenders of locomotives, and to street-cars of all kinds; and its object is to reduce the amount of wear between the bearing-surface of the journal and that of the brass, and at the same time to provide perfect lubrication of these parts.

In the accompanying cuts, Fig. 1 is an end sectional view of the bearing, and Fig. 2 a side sectional view.

The journal consists of a cast-steel cylinder or sleeve B, lying on the axle A, and under the brass C, which sleeve takes all the friction of the brasses and saves it from the axle. The diameter of the sleeve being considerably greater than that of the axle, the sleeve dips into oil in the bottom of the box receiving a thorough coating of the same, inside and out, thus copiously lubricating the brasses, and largely extending their life, without waste of oil as at present.

None of the weight bears on the cogs, which are $\frac{1}{16}$ of an inch short of touching; the weight is carried entirely by the sleeve and axle on each side of the gears. The axle and sleeve revolving together, and at the same speed and in the same direction, the axle sustains no friction, and consequently no wear. The diameter of the axle at present is made larger than absolutely necessary in order to allow a margin for wear. There being no wear of the axles by this system, or deterioration through heating,

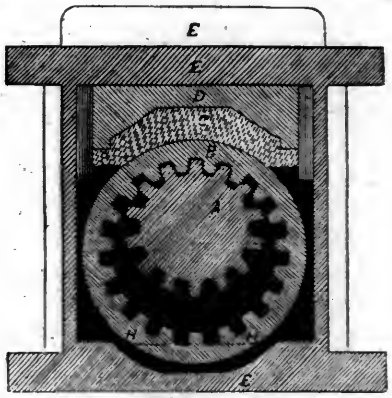


Fig. 1.
GOUILLOUD & PAGE'S JOURNAL-BEARING.

they can be made of smaller diameter, giving favorable leverage—a very important factor in the hauling power required. On the axle now in use, the collar cuts into brasses, and uses them up; and the vertical part of the collar, which bears on the end of the brasses, frequently running dry or without oil, besides wearing the brasses, is a fruitful source of hot-boxes; it being admitted that it is at this point that the heating almost invariably commences.

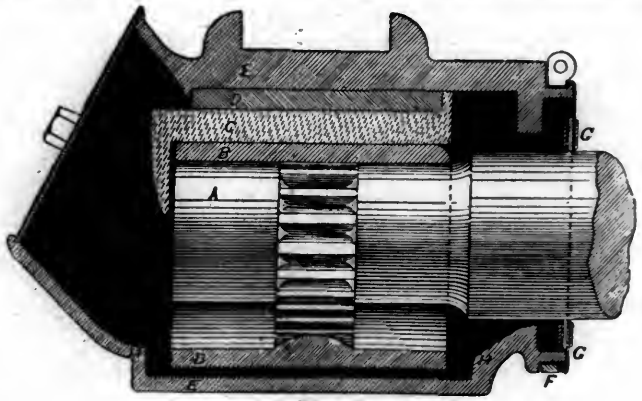


Fig. 2.
GOUILLOUD & PAGE'S JOURNAL-BEARING.

With this form of journal this collar is done away with, a flange cast at the end of the brass doing its work. Waste for packing being entirely dispensed with removes another frequent cause of hot-boxes, waste and oil being combustible of themselves even without the friction of the axles. The dust-guard shown at F and G, in the cuts, is not essential to the journal, but its use is recommended as the desirability of excluding dust from the boxes is well known.

The following advantages in this form of journal-bearing are claimed by the inventors: 1. Ample, abundant and perfect lubrication, uniform, and at all times and under

all circumstances reliable. 2. Greatly extended duration or life of bearings or brasses which by use of this journal are increased at least six fold. 3. Saving of axles, on which there is no friction. 4. Entire saving of waste as packing. 5, large economy in oil. 6. Hauling power required materially diminished, a point the importance of which it is difficult to overestimate. 7. All danger of hot-boxes or heating, and the expense and detention of cars resulting therefrom, is completely obviated. 8. Danger of cracked wheels from expansion of axles by heating removed. 9. Saving of labor. 10. The peculiar balanced action of the sleeve on the axle gives an elasticity to the movement of the trucks, greatly facilitating the starting of the train; practical experience having demonstrated the fact that a train can be *started* with little or no more power than that required to haul it. 11. The simple, reliable and thoroughly substantial nature of the journal, which will last the life of the car, and can be sent on extended "through business" with perfect confidence as to the result.

The journal has been subjected to severe and exhaustive tests with passenger and heavy freight-cars, and has in every case given satisfactory results.

The device is now entirely controlled by the Union Bearing and Lubricator Company, of Montreal Canada, and Portland, Me., to whom the inventors have assigned their patent-rights.

American Railroad Journal.

WHOLE NO. 2,573.] NEW YORK, FEBRUARY, 1886. [VOLUME LIX.—NO. 11.

THE IMPORTANCE OF PROPER LUBRICATION ON RAILWAYS.

BY E. F. DIETERICHS.

[Written for the AMERICAN RAILROAD JOURNAL.]

MANY appropriate remarks have been made as to how very little things can become the cause of serious accidents on railways. Breaking of axles, car-wheels, rails and parts of machinery is caused from unequal strain or defects of the materials, so little as to be easily overlooked or brought about through inaccuracy of workmanship apparentiy so slight as to be put aside as trivial. Rails not properly and evenly secured on imperfect foundation, axles and wheels and machinery not in proper bearing to each other, irregularly loaded with changing weight and under rough usage generally soon deteriorate in their weakest parts and become liable to sudden breakage. The constant vibration and jarring, together with the continuous expansion and contraction under changing temperatures from natural influences and from friction, gradually disintigrate the metal and weaken its strenght to final breakage.

To prevent accidents from such causes, the remedy lies in purchasing material of the very best quality, employing the very best of skilled labor and using the utmost care in handling, and keeping in as perfect order as possible all parts in any way subject to the influences mentioned. Another point, also usually but little considered, is the lubricating of rolling-stock and machinery; yet small as this point may appear, its neglect can be the cause of serious accidents, and it requires just as much attention as the points mentioned above.

As it is the first consideration with rails, axles, car-wheels and machinery, to guard against primary causes of accidents by selecting the very best material and the best experience and workmanship, so also none but the very best of lubricants should be selected and be applied intelligently. Purchasing and using lubricants of poor material and made by parties solely bent on gain and ignorant of the principles of lubricating and the character of the material used, is equal to the purchasing of poor steel or iron and its working by careless, ignorant and unskilled labor. Accidents resulting from such practices cannot be called non-preventable accidents.

Lubricating with the very best material cannot prevent overheating and consequent injury to the parts and accidental breaks when the parts are either defective in material or mechanically untrue from careless and poor workmansnip or rough usage. No lubricant, however pure and efficient, can make a bearing run true and prevent its heating when out of line, too tight in fit or otherwise defective, or so constructed as not to allow the lubricant to reach freely those places where its work is expected to be done. A lubricant cannot remedy the mechanical defects in cylinders or valve-chests; it cannot prevent cutting when rods are out of line and rings not properly set or worn into ragged edges. The purer the lubricant, the better in quality and the more efficient on scientific principles, the more perfect mechanical construction is necessary to its perfect practical working. Proper time for consideration and thorough study of the subject of lubricating and lubricants should be given by those in charge and whose presumed greater intelligence over the ordinary employé should enable them to comprehend more fully the equal importance of closer attention to this subject, as a great factor in apparently trivial causes of breakage and accidents. It will be found worth while to enumerate and consider a few of the more pertinent points on this interesting and important subject.

Most engineers remember when tallow was universally used as a lubricant in locomotive-cylinders, and no argument against the custom was capable of convincing intelligent mechanics that it was a poor lubricant. At every overhauling of the engine hard and heavy black gummy deposits were found in valve-chest and cylinder, and in time the ravages made on the metal by the fatty acids became more and more perceptible, the iron, especially when of poor quality, fairly becoming honeycombed. In the application of tallow as a lubricant, small quantities of it are introduced into the cylinder at regular intervals and are speedily acted upon by the hot steam under pressure. This sets the lighter fatty acids free and separates them from the heavier and solid stearine, which forms the gummy deposits—a black conglomeration of stearine with particles of abraided iron. These conglomerations steadily increase and, soft at first, are baked harder and harder by the dry heat retained in the metal after every laying off of the engine. Frequently they accumulate so rapidly and to such an extent that particles breaking loose are often found behind the rings in the shape of round balls formed by being rolled back and forth with the motion of the follower.

After tallow, lard-oil became the leading lubricant and when pure gave better satisfaction than tallow. But lard-oil and all fatty oils decompose likewise under influence of steam and pressure in the cylinder, and form gummy deposits, although their defects are less perceptible and their practical demonstration requires more time, and engineers that were accustomed to the use of such a thick, heavy and dragging lubricant as tallow, could not readily change all at once to something of different characteristics.

Later, mineral oils were used, mixed with tallow, lard-oil and other fatty oils, and frequently and most injudiciously with drying oils; but the defects were only reduced to the amount of the admixture and the demonstration of

it longer delayed. Recently the filtered mineral oils were brought into use, and while they are less injurious to metal, their too volatile character has not permitted the realization of what was expected and promised of them as cylinder lubricants. Then they were applied with an admixture of fatty oils and the individual defects of the latter were again presented.

All such thick and gummy oils, as well as tallow, fill the intervening space between the cylinder-shell and the follower and will allow the running with loosely fitting rings, but they cause dragging and thereby lose power and fuel. Lubricants of proper consistency, but unable to decompose and form gummy deposits, will ease the motion, permit a closer setting and tighter fit, and economize power and fuel.

Mankind is much inclined to onesidedness or crazes, epidemic-like, and often it needs but skillful advertising and bold representation to draw the people to follow a lead blindly, however contrary to reason and fact. So it is with the subject of lubricating and lubricants which offers such a large field for misrepresentation and misappreciation; so helpful to sharpers who embark in the business wholly incapable but for what in these days is called pluck and ability. Skillful mechanics cannot be manufactured to order and at short notice: it requires experience, close observation and steady application for a numbers of years to become such. So also the manufacturer of lubricants must be brought up to his trade, not by merely imitating what others are doing, but by study, experience and close application to the business for a number of years. The mere mixing, compounding and indiscriminate selling of lubricants may deceive those who cannot or do not care to appreciate real merit and efficiency, but they cannot equal the products of skilled labor.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,
SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.—THE UNITED STATES.

V. RAILWAYS EAST OF THE MISSISSIPPI RIVER.

THE ILLINOIS CENTRAL RAILROAD COMPANY'S

medical service dates from 1878, and was organized for the special and almost sole object of affording surgical relief to passengers and employés injured anywhere upon its lines. The staff consists of a superintending surgeon and assistant district surgeons at the most important points, and local surgeons at most of the stations from Sioux City and Chicago to New Orleans. The last class are remunerated according to a fee-bill for services actually rendered; the others receive fixed salaries.

For injuries received in discharge of duty, and no others, employés enjoy the privileges of this service, which is solely at the charge of the company. Patients are sent to civil hospitals at the discretion of surgeons and with their own consent. No provision is made for medical attendance in ordinary sickness, nor for the families of employés. District and local surgeons report all cases treated by them to the superintending surgeon at Chicago, on printed forms.

Locomotive engineers and firemen on the divisions of the road in Illinois and Iowa are examined for visual power and color perception. This is the full scope of the examination, and it has not been put in practice south of the Ohio river.

I am informed by the superintending surgeon, Dr. John E. Owens, that this system affords great satisfaction to employés, and that it is not expensive to the company. Also that "donations are often made to relieve the necessities of married worthy employés, their widows and families;" and that employés, so far, do not favor independent organizations among themselves for mutual relief. It is evident that this service, up to its narrow limits, is very well organized and administered, and has a staff in readiness for expansion of its functions so soon as the management may adopt the policy.

THE CHICAGO, BURLINGTON AND QUINCY RAILROAD COMPANY

employs a firm of physicians, at a fixed salary, to superintend its medical affairs. Physicians are selected at all important towns to attend solely to surgical cases resulting from accidental injuries of employés and passengers. "Any bills for medical services are paid by the company, or by the person injured;" from which it may be inferred that the company's medical policy is governed by its legal responsibility. A hospital has been established at Burlington, Iowa, for the benefit of those injured upon the road.

There is no systematic examination of any class of employés, nor sanitary supervision of *personnel* or property of the company. There seems to be no voluntary organization for mutual relief and assistance among the employés of the company, but "individual employés insure in various ways."

"Live-stock is unloaded and fed in the company's yards at regular intervals;" no other regulations are mentioned.

The above service, "such as we have, has been in effect ten years."

THE CHICAGO AND NORTHWESTERN RAILWAY COMPANY

organized a medical service in 1865, with a general surgeon and assistants residing at central points, who receive salaries. Their duty is to attend persons injured by accidents. No contributions are required of employés, nor has the company any hospital of its own. No physical examination of employés is made, it being presumed that a man who is not run over and killed by others will be equally considerate on his own part.

The company grants relief "in all worthy cases" to the families of employés in cases of injury, sickness or death. No voluntary associations of men are reported.

It is said that regulations exist relative to transportation of live-stock, to prevent overcrowding, deprivation of food and water, too long confinement, or admission of diseased animals to cars for transportion; but no particulars are stated.

The personal hygiene of employés and the sanitary condition of railway carriages, buildings, grounds, etc., are said to receive attention, but no details are given.

THE BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY COMPANY

has a medical service which was organized in 1876, of similar method and scope to the preceding. No provision is made for relief of families of employés. Legal enactments alone govern the transportation of live-stock.

THE CENTRAL RAILROAD OF GEORGIA,

since 1880, has engaged surgeons at the principal points to attend employés suffering from accidental injuries. They are paid by the company the ordinary fees of private practice, and no question of individual fault is raised in giving relief. There are no hospital arrangements, no physical examination of employés, no sanitary regulations and no separate organizations for mutual assistance among employés.

THE CHESAPEAKE AND OHIO RAILROAD COMPANY,

in 1883, organized a medical service for the relief of passengers and employés injured by any casualties of travel or duty. The staff consists of a chief surgeon, appointed by the general manager, and district and local surgeons at various points along the lines. There is no assessment upon employés, as the service does not extend to ordinary cases of sickness. The company has no hospital of its own, but has special arrangements with local hospitals at Richmond, Va., White Sulphur Springs, W. Va., Lexington, and Covington, Ky.

It is apparent that the medical service of the above-named companies is intended chiefly, if not solely, to obviate expensive litigation with persons injured by railway accidents. By this means the work of the law department is materially lightened. On the lines of the Vanderbilt system and on all the railways of New England the first step to an organized medical service is not yet taken. There the surgical expenses of accidents are settled altogether by the legal profession, and it is safe to conclude that the temple of justice, like the Roman temple of Janus, is rarely closed.

THE FITTING UP OF LOCOMOTIVE LINKS.

BY FRANK C. SMITH.

[Written for the AMERICAN RAILROAD JOURNAL.]

I NOTICE in the issue of a contemporary a communication on slotting links in which the writer says, "in repairing, however, the built-up (skeleton link) is probably the cheapest, as the two halves can be let together to take up the wear, instead of having to put a new link block in."

Not only the writer of the article but the editor of the paper are evidently not aware of the fact that roads repair or take up the lost motion in solid links without fitting new blocks, by heating the ends of the link and dipping them several times in water up to the lines *a b* and *c d*, shown in Fig. 2 of the accompanying cuts, thus "closing" the link by the contraction of the ends. Where this method will not close them sufficiently, they may be heated and the ends placed on an anvil *c*, and closed with a few blows of a flatter *a*, placed as shown in Fig. 3. Several large roads use a press especially arranged to close the link by pressure. The saddle-holes, of course, have to be "oblonged" a little to allow for the closing of the link.

Where a shop is not fitted with a slotting machine and it is desired to use some other tool than the planer or slotter for finishing links, the plan shown in Fig. 1, for using a shaping machine or compound planer, will be found valuable. I have never seen it used save in one shop and it is not generally known. *d* is the link fastened in the chuck of a shaping machine; *e* the tool, looking at the machine from its front; *f* the bed; *a* the cross-feed screw, and *c* the cross-head. To the bed or table of the shaper *b*, a lug *j*, is fastened, which is attached to a sleeve *i*, having a set-screw for fastening it to a bar *h*. At one end of this bar is a slide or cross-head *k*, which may slide

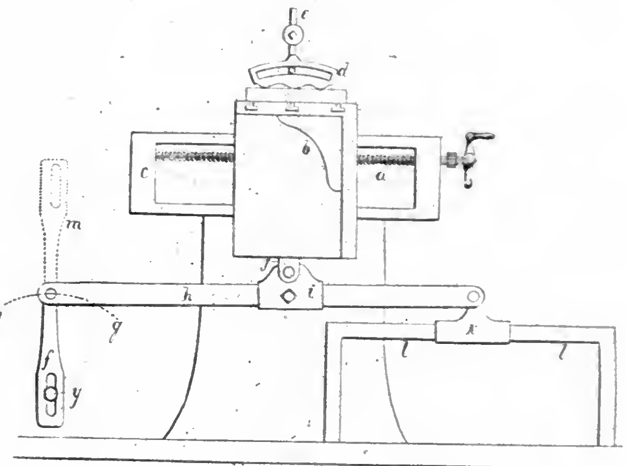


Fig. 1.

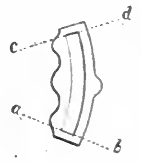


Fig. 2.

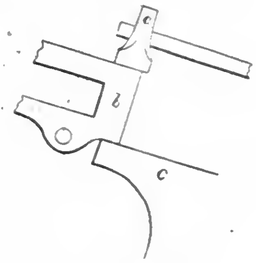


Fig. 3.

back and forth in the guide *l*. At the other end is an arm *f*, capable of rotating in a stud *y*, its upper end moving through the arc *g g*. The clamping-nuts of the cross-head *c*, are loosened so that the cross-head may slide on its ways up and down. The principle of the device is that each portion of the bar *h*, nearer to the cross-head *k*, will move through a flatter arc than that due to the length of the arm *f*. It is therefore only necessary to adjust the bar, by sliding it through the sleeve *i*, until a point is found on it which causes the point of the tool to follow the arc described on the link, and bolt it fast. As the table *b*, is fed across by the screw *a*, and is fastened to the bar *h*, it is evident that it, with the cross-head *c*, will follow the arc described by the sleeve *i*. If the arm *f*, be reversed, as shown by the dotted lines *m*, the curve will be reversed.

THE OUTSIDE PAINTING AND VARNISHING OF PASSENGER-CARS.

BY WILLIAM DAVIS.

[A Paper read before the recent Convention of the Master Car-Painters' Association.]

I WILL endeavor in this paper to lay before you a few thoughts on the outside painting of a passenger-car. It is somewhat embarrassing to me to lay before you or embody in those thoughts anything that may enlighten you, as we have discussed the outside painting of passenger-cars time and again, as well as given the modus operandi employed by different car-painters, and yet, gentlemen, what decision have we arrived at as an association? Have we arrived at a uniformity in this matter? I will venture to say that there is just as much difference of opinion now as there was years ago under these circumstances. I will only speak or, as it were, generalize, on a few points in connection with this subject, and if possible see what progress has been made by this association in the matters of beauty of finish, durability, and economy in the painting of passenger-cars.

First. We will take a glance at what many of us consider the most important step of all, and which is, in fact, the basis or foundation upon which we build the structure of painting, ornamenting and varnishing our passenger-cars—the primer or filler. I have no doubt that all know what constitutes a good and reliable filler; and unless we do, and see to it that it is properly mixed and properly applied, all our labor of painting, etc., will be useless, and inevitable troubles will be sure to follow. Now, gentlemen, as most of you are aware, there is a great diversity of opinion as to what is the best primer. Some advocate lead and oil, while others again advocate one or another of the different patent fillers that are in the market. Should we not be a little cautious how we accept the latter? They may be good; but unless we know their formulas or thoroughly know their component parts and have tested them, and are assured by these means that they are better and cheaper than our old standards, we should not adopt them; on the other hand, if they are good, we would only be doing justice to all to adopt their use.

We next come to the surfacing or rough-stuff. How far, gentlemen, are we a unit in this matter? Some claim that scraping is the best, others some patent surface, while the rest adhere to the old-time method of rough-stuff, and a few don't believe in a great amount of surfacing, claiming that it is the chief cause of blistering, cracking, and in fact, mostly all the deviltries that a car is heir to. Now, while the writer agrees with the necessity of surfacing, and, in fact, cannot see well how it can be done without, yet if there is any trouble arising from this cause it is invariably the fault of the painter; and I have no doubt that a great amount of the cracking, blistering, etc., is caused by the injudicious mixing of rough-stuff as well as the method of rubbing. We are very apt to lay the blame on the varnish; and I may say here that it is a good job for us that the varnish-makers and their agents are a long-suffering people, willing to bear the burden of others on their shoulders, or we might long ago have been wiped out ot existence. We cannot use too great care in mixing our rough-stuff or surfacer. It should be mixed as elastic as time will permit, and rubbed as close as possible, being careful not to rub through to the wood, and after the rubbing is com leted care should be taken as to the nature of the next coat of paint we put over the surfacing coat. This coat of paint should be elastic enough to allow the surfacing coat to absorb all it requires to fill up its porous and spongy nature, and yet have sufficient binding properties to form a gooa, hard, solid surface to put our finishing or color coats upon. I believe some put their flat, hard color coats on top of their surfacing coat, and whatever small amount of vehicle there was in the first color coat is absorbed by the porous nature of the surface coat, and thus nearly all affinity between the two coats is lost, and in time flaking necessarily follows.

I shall next give my ideas on the color coats in this part of the work. I have no doubt some will differ from me in opinion. My own opinion is that instead of making your color coats a dead flat by mixing them only with turpentine, a small portion of oil or finishing varnish should be added, just sufficient to bind your colors and allow of their falling down nicely. Do I believe in the method of putting on two coats in one day? By all means I think we should allow twelve hours at least between coats, and more if possible. By adopting this plan I get a good surface on which to do all my ornamental work, and besides, while the striping and ornamenting are going on on the flat color coats, time is given for the whole to harden.

Very little can be said here on the subject of ornamentation, but I am pleased to say that there is a very marked improvement both in regard to quantity and quality. It shows very bad taste and very poor economy to cover our cars indiscriminately with ornamental work without due regard to thought and character. Would it not be better to confine the ornamentation to the most prominent parts, such as corner-posts and sign-boards, etc.? We should also give attention to harmony of colors. For instance, let the sash, corner-posts and sign-boards be in harmony with the body of the car. The harmony of coloring is a beautiful study, of which we should all avail ourselves, as it will well repay us for the trouble.

And now we come to the last process necessary for the finish of our passenger-cars—varnishing. There has been a great deal written and said on the deviltries of varnish, and truly their name is legion; and as I said before the varnish-maker comes in for a great share of blame, and perhaps unjustly so. But I need not say more on this subject; you are all aware of the troubles and annoyances incidental to varnishing. As far as I am concerned I have very little trouble—only what is incidental to changes of atmosphere and others that we have no control of. Many of you use outside rubbing varnish; so did I, several years ago, but I have discarded its use nearly altogether, using finishing varnish with a small portion of rubbing added, and upon this coat I rub very lightly—just sufficient to take off the nibs—using, at the same time, a rubbing brush that we have made for the purpose. I finish up with two coats of finishing varnish. Thus you will see I insure durability as well as economy, as I believe troubles will arise by the too frequent use of rubbing varnish on the outside of passenger-cars. And now, gentlemen, I will say in conclusion that unless we can study the theory or science in painting, to a certain extent.

as well as have the practical part, we will not be able to arrive at a standard method of painting a car, or understand what has been the cause of these troubles that we have to contend with; for it is an old saying that "every effect has a cause," and unless we set our minds to study these things we will have always to contend with failures. But, on the other hand, he only who studies all these effects, as well as the true beauty of ornament, and also the science of coloring (for the harmony of color is a theory or science in itself) can prove successful in painting and decorating our passenger-cars.

THE QUESTION OF BRAKES.

RAILWAY managers are now called upon to consider the numerous advantages of power-brakes for freight-locomotives and automatic brakes for freight-cars in comparison with the old-fashioned hand-brakes. If economy and a reasonable regard for the safety of human life alike demand that the old should give place to the new, no false ideas of conservatism or expense should delay the desirable movement.

The importance of the ability to stop freight-trains quickly cannot be overestimated. The number of such trains and the rate of speed have been largely increased during the last fifteen years and although by careful watching, and the use of the telegraph and electrical and other signals, the danger of accidents has been lessened, collisions are still of too frequent occurrence. In spite of the most careful management trains run into each other and life and property are destroyed.

If quicker stops could be made, fewer accidents on account of obstructions would happen. Every company now has a long list of claims to settle for stock killed or injured, which would be lessened, if engineers were able to better control their trains. The stops at stations, crossings and water-tanks consume more time because the heavy trains must slacken up when far away from the halting place. This is especially the case when on a down grade.

Freight and equipment are seriously injured by the violent shocks they receive when the trains are being made up. Besides the loss of time consumed in shunting, the locomotives and cars are bruised and injured and the brakemen exposed to greater risks, all because the unwieldy switch-engines have no power-brakes to control their movements.

It may be remarked here that, while the old-fashioned hand-brakes are better than nothing, they are entirely inadequate for their intended purpose. Possibly they did moderately well in the old times when the freight-cars were light and the locomotives small and imperfect. Now the cars are loaded twice as heavily as ten years ago and the locomotives weigh two or three times as much. In consequence of this greater power in the engines the trains are larger. But the grades of the roads have not been reduced nor has the power of the brakes been increased. The results can be inferred.

One of the greatest defects of the hand-brakes was the inability to apply them quickly in case of emergency. When the brakemen were at their posts in approaching stations stops were made with reasonable promptness, but when the danger signal was given out on the road it almost invariably found the brakemen in the caboose. Hasten as they might, it was several minutes before they could set any brakes at all. If the train was made up of open cars loaded with machinery or lumber, progress was slower and risk to life greater. When the brakes were ready to be applied the train was in the ditch or the cart piled up on the track.

Right here may be noted the powerlessness of the hand-brakes to protect life. The brakemen always have taken their lives in their hands. If the night was dark or stormy, or the tops of the cars slippery with ice and snow or rain, the brakemen had to crawl along the tops of the cars with the greatest caution, and even then many a gallant fellow went down to death. What an idle form when an obstruction was suddenly sighted on a dark, stormy night to call for the brakes!

The damage to equipment caused by this lack of power in the brakes was, and is, in the aggregate enormous. Whenever an obstruction was met or a sudden stop from any reason became necessary, the engineer would reverse his engine, The effects of this were dangerous in the extreme, for drawheads and bumpers were broken, trucks were thrown out, train-men killed, and the sparks and cinders in the steam-chest and cylinders, cutting and roughening the smooth surfaces and valves, did serious injury to the locomotive. In making up trains and in switching the same destructive effects were noted. If rough usage is ever to be found it is seen in every yard and terminal station. The wonder is that equipment is not damaged more.

The loss of time on account of these defective brakes in the aggregate amounts to hours and days. A few minutes unnecessary delay of every freight-train at every stopping-place causes a large per cent. of additional expense. Clear it is from these facts that some appliances were needed whereby these defects might be cured and the evils remedied. The tests and experience of the past year seem to show conclusively that power-brakes for freight-locomotives and automatic brakes for freight-cars have been discovered, which do substantially all that is desired of them. The advantages of these appliances are numerous, and the first one is that, while comparatively inexpensive, they do their work infinitely better. The wear and tear is much less and the saving amounts to thousands of dollars annually.

The demand of the times is for fast freight-trains. On the important through lines through freights make passenger time. Now recollect the deficiencies of the hand-brakes and the necessities for quick stops, and consider how this increase in the speed of trains increases the dangers to the crews, to passenger-trains and to property of the companies generally. What chance does a heavy freight on a down grade stand of coming to a halt if an obstacle is met? What chance do the crew have for their lives when the danger whistle sounds?

As these heavy trains rush over the road how can they halt at the stations and crossings without a long preparation? At the tanks and coal chutes there is generally considerable backing and pulling before the right position is reached. With the power and automatic brakes all this is avoided, and the stops are made twice as quickly and easily. It is estimated by reliable authority that, in making up trains and in switching, an engine having the

power-brakes will handle fifty per cent. more cars than one without these appliances. The consequent saving in the wear and tear of equipment is enormous. With the hand-brakes it is believed that every time a train goes over the road the loss of wear and breakage and loss of link-pins and couplers amounts to $10 or $15. With the automatic and power brakes this cost is reduced to a minimum. One year's savings would apply the new inventions. If the trains could stop quickly less stock would be killed and fewer collisions would occur or derailments happen.

And what shall be said of the protection to human life to be caused by the general application of these new brakes, giving the engineer control of his train? Is this to be estimated in money? Surely for this saving, if no other reason, the new appliances must come into universal use. Thoughtful railway men must be convinced by these facts that self-interest and a slight regard for economy as well as a decent respect for humanity demand the application of these power and automatic freight-train brakes. When the change is made all will wonder how they ever did without them, for they will be considered indispensable. The time for this change and the adoption of these appliances has come.—*Railway Register.*

AMERICAN LOCOMOTIVES OF 1885.

DURING the year 1885 there were fewer locomotives built in the United States and Canada than in any year since 1880. By correspondence with locomotive-builders and the leading master mechanics, we have obtained a fair approximation of the number of engines built throughout the country, although there was very great reluctance displayed in many quarters to reveal the limited extent of production. Seven of the leading builders sold 616 locomotives during the year, and it is a liberal estimate to credit the builders who declined to let their production be known, and the various railroad shops, with 200 more locomotives. This would bring the full list to about 800. Of the engines built, 83 were for export, leaving about 717 to supply the home demand. Two years ago, the seven builders that turned out 616 locomotives last year, built 1,346 engines, and the trade was beginning to grow depressed then. But in that year 282 locomotives were exported from the United States, the whole being valued at nearly three millions of dollars. The condition of matters abroad that reduced our exports to their present dimensions, indicates serious depression in foreign railroads as well as among our own.

The intense depression in our locomotive-building has not been caused by the railroads being overstocked with motive power, for many of the roads are very much in want of engines, and the managers only refrain from buying new ones because it is possible to get along a few weeks or months longer before the outlay is imperative. This is not good management, for the work is now done with worn-out machinery at increased expense, and the renewals will be delayed till the prices of locomotives begin to advance rapidly, when the orders will help to bring about another period of fancy prices. The practice followed by so many railroad managers, of permitting their machinery to go without renewal or proper maintenance during times of business depression, exercises a most injurious influence on the country's industries, for it tends to force business down in dull times, and gives trade an artificial lift when the reaction comes round. It appears to be the course for natural retribution that the roads which follow the policy indicated should have to pay fancy prices for their machinery when they get ready to buy, and the only cause for regret about that is that their pernicious policy punishes innocent parties.

There have been remarkably few locomotives built in railroad shops during the last year, and the new work done has been carried on principally to steady the fluctuations of repair work. Considerable attention has been directed to working out improvements on the locomotive. Seasons of depression in the transportation business have always exerted a stimulating effect upon the progress of locomotive improvement. The way in which most of our railroads are operated leaves very little opportunity to work out improvements in machinery when business is active, for the demands of transportation are generally beyond the capacity of the motive power, and all that is thought of is to get the trains moved. But when freight is hard to find, when rates are low and locomotives at a discount, the demand arises for reduced expenses, and attention is directed to the problem of making the locomotive do its work at less expense for fuel and repairs. In many quarters master mechanics are striving to find ways and means for taking more of the heat out of the products of combustion by imparting to the water part of the heat that usually passes into the smock-stack. Others are working on the problem of taking more work out of the steam as it passes through the cylinders, while many are still engaged working out the simplification of parts that reduces the expense of repairs.

It seems to us that those who are striving to utilize more of the heat produced by the coal are working in the line of experiment likely yield to the best results. The leading fault found with the American locomotive by its detractors has been that it evaporates too little water for the fuel consumed. The best friends of the engine can hardly say that the accusation is groundless. We have some locomotives evaporating as much water per unit of heat in the fuel as any locomotive running, but that is not the characteristic of our engines. There is serious waste of fuel going on that ought to be avoided. Various causes contribute to waste of coal by our locomotives. The first cause which ought to be susceptible of the easiest remedy is bad firing. A great deal has been said and written in the last few years about improving the methods of firing our locomotives, but the majority of firemen work on in their own wasteful way undisturbed. So long as the autocrat of the scoop is permitted to laugh the principles of combustion to scorn, the locomotive designer can not produce an engine that will make a good record in economy of fuel. Improvements in the methods of supplying air to the fire will, probably, in many engines produce more efficient combustion of the gases; but the most important and promising line to work on, after improving the character of firing, is to find the means of increasing the difference between the fire-box and smoke-box temperature. The smoke-box temperature of our locomotives averages about 200 degrees higher than it ought to do. This represents great loss of heat. The master mechanic who succeeds in reducing the

smoke-box temperature of his engines 150 or 200 degrees. while maintaining the fire-box temperature, will make his work felt on the coal-pile.

Our master mechanics who are interesting themselves in taking more work out of the steam are doing nothing in the way of compounding the locomotive. Our most advanced and enterprising railroad mechanical men have no expectation that a compound locomotive would be successful. In various ways attempts are being made to obtain more expansion of the steam by using improved valve-gear, and some of those who have applied this line of improvement to slow-working locomotives speak very encouragingly of the results. There are hundreds of locomotives working on our mountain roads that receive no benefit whatever from the expansion of steam. There ought to be no difficulty in effecting material improvements on locomotives doing work of this character. Improving the distribution of steam in a high-speed locomotive is a more difficult problem, for some of our best link-motion engines use the steam in a way that leaves little to be improved.—*National Car-Builder.*

THE RELIEF DEPARTMENT OF THE PENNSYLVANIA RAILROAD.

THE Pennsylvania Railroad Company announces the creation of a new department in its service, having for its object the establishment and management of a relief fund, for the payment of definite amounts to employés, who, under the resolutions, shall become entitled thereto, when they are disabled by accident or sickness, and, in the event of their death, to their relatives or other beneficiaries. In connection therewith, the department is to exercise supervision over sanitary matters affecting the health of employés, and put in operation measures to secure conditions favorable thereto. The fund will be created by an application to that purpose, under contracts of employment, of portions of the wages of employés, at uniform rates, graded in amount according to their regular pay. The company will be trustee for the fund and responsible therefor, pay any deficiencies which may arise from the fund not proving sufficient to meet the demands upon it, manage the department, pay the operating expenses, furnish the necessary office room, and grant the services of its officers and agents without charge upon the fund. All the railway and ferry companies in which the Pennsylvania Company has a large interest, and whose works are associated in management, have adopted similar relief projects, and entered into an agreement with the Pennsylvania for their joint supervision. This plan has been approved by the board of directors, and printed copies can be obtained by employés from the division officers. The general features of this plan are as follows:

1. The creation of a new department in the service, to be known as the Pennsylvania Railroad Relief Department, having for its object the establishment and management of a fund, to be known as the Relief Fund, for the payment of definite amounts to employés who, under the regulations, shall become entitled thereto, when they are disabled by accident or sickness, and, in the event of their death from accident or natural causes, to their relatives or other beneficiaries. In connection therewith, the department is to exercise supervision over sanitary matters affecting the health of employés, put in operation measures to secure conditions favorable thereto, and take charge of such kindred matters as may be assigned to it.

2. The fund will be created by an application to that purpose, under contracts of employment, of portions of the wages of employés, at uniform rates, graded in amount according to their regular pay. The company will be trustee for the fund and responsible therefor, pay any deficiencies which may arise from the fund not proving sufficient to meet the demands upon it, manage the department, pay the operating expenses, furnish the necessary office room, and grant the services of its officers and agents without charge upon the fund.

3. Those who shall become entitled to the benefits of the fund will be known as "Members of the Relief Fund." Their admission to its privileges will be based on applications to be made by them in the form and under the terms prescribed in the regulations of the department.

4. The department will be in charge of a superintendent, who will be aided by an advisory committee consisting of members, chosen equally by the employés who are members of the fund and by the board of directors of the company, with the general manager of the company and the superintendent of the relief department as *ex-officio* members.

5. The benefits will consist chiefly in: Payments of stated amounts to members disabled by sickness or by injuries received in the discharge of their duties; payments of stated amounts to designated relatives or other beneficiaries of deceased members; free surgical attendance for members disabled by injuries in the discharge of their duties; arrangements for fixed moderate rates, of which members may avail themselves, for medical attendance in case of ordinary sickness; medical supervision over sanitary and other matters affecting the health of members.

6. For the purpose of determining the monthly rates, members will be divided into classes, according to the amount of their regular wages per month, as follows:

1st Class—Those receiving not more than $35.
2d Class—Those receiving more than $35 and not more than $60.
3d Class—Those receiving more than $60 and not more than $80.
4th Class—Those receiving more than $80 and not more than $100.
5th Class—Those receiving more than $100.

For members not paid by the month, the classes will be determined by the usual amount of earnings per day.

As far as practicable, those in similar grades of the same kind of service will be classed together without regarding slight variations in the pay of individuals from the limits assigned for the several classes.

The rates for the first class will be 75 cents per month; for the second class, twice as much, $1.50; for the third class, three times as much, $2.25; for the fourth class, four times as much, $3.00; and for the fifth class, five times as much as for the first, $3.75.

The amounts applied by employés to the purposes of the relief fund will be deducted from their wages on the pay-rolls monthly in advance, and placed to their credit in the fund.

7. The accident benefits per day, not including Sundays, are for the first 26 weeks: First class, 50 cents; second class, $1; third class, $1.50; fourth class, $2, and fifth class, 2.50. After 26 weeks the benefits are half the above figures. The sick benefits per day, not including the first week or Sundays, and not longer than 52 weeks, are the same as for accident benefits for the first 26 weeks.

The payments in the event of death from accident are to be: First class, $500; second class, $1,000; third class, $1,500; fourth class, $2,000, and fifth class, $2,500. In cases of death from natural causes the benefits are one-half the amount given in the event of death from accident. Under specified conditions members may enter classes higher than those to which their pay assigns them and may take additional natural death benefits.

8. In order that the cost of the proposed benefits may be as small as possible, and each member derive all possible benefit from his payments to the relief fund, the number participating must be large and regular. In view of this and of the responsibility assumed by the company, it will be a condition that each person entering the service or promoted in it, after the inauguration of the department, shall become a member of the relief fund and participate in its benefits. Persons in the service at that time will, for six months thereafter, be afforded the privilege of participating without regard to age or physical condition.

9. The operations of the relief department will commence February 1st, 1886, from which date applications will be received. The payment of contributions and the title to benefits will not commence until February 15th, 1886. Applications are to be made to those under whom the applicants are employed, who will afford employés an opportunity of examining the regulations of the relief department, and will furnish blanks for applications, and any required clerical assistance in filling them up, and will forward them as may be directed. As the privilege of participation will hereafter depend upon age and physical condition, those now in the service may be debarred from participation if they delay applying until after the period during which the privilege is open to them.

10. The company having established this method of relief for its employés, and undertaken the management and expense thereof, will discontinue the allowance of gratuities after the expiration of the period of six months before mentioned, and all fines paid by employés for dereliction of duty will be added to the relief fund.

The Northern Central Railway Company, the West Jersey Railroad Company, the Philadelphia, Wilmington and Baltimore Railroad Company, the Camden and Atlantic Railroad Company, the Baltimore and

Potomac Railroad Company, the West Jersey Ferry Company, and the Camden and Philadelphia Steamboat Ferry Company, in which corporations the Pennsylvania Railroad Company is largely interested, and whose works are associated in management, have adopted similar relief projects and entered into an agreement with this company for the joint management of their several relief departments, with that of this company. For convenience of designation the joint operations of the said relief departments are to be conducted under the title of "The Pennsylvania Railroad Relief Department," all applications by employés and the agreements therein being made, however, to and with the company in whose service the applicants shall be, each company assuming obligations with regard to the same, and to their employés in connection therewith similar to those assumed, as above stated, by the Pennsylvania Railroad Company.

The following general notice in reference to the matter has been issued by General Manager Pugh:

"The regulations for the government of the department have been prepared upon large sheets to be displayed in shops, stations and other prominent places, where they may be seen by those in the service, and in book form for the use of officers and of employés who cannot be conveniently reached by the other method.

"It is desired that officers bring the regulations fully to the notice of employés, and that they supply each one with a copy of the circular of the president of the Pennsylvania Railroad Company introductory of the relief department, and a copy of the blank form of request for admission to membership in the relief fund. They will also take measures to facilitate such request and the completion of applications for membership, and otherwise carry out the object of the department and the instructions issued by the superintendent thereof.

"The privileges to which present employés are entitled as to admission to membership, without limitations as to age and physical condition, should be explained to them, and the requirements upon these points as to new employés should be carefully examined and conformed to.

"The organizations for conducting the relief department provide that the business shall be in charge of a superintendent and an assistant superintendent, and the following appointments have been made: J. A. Anderson, superintendent; Holmes D. Ely, assistant superintendent.

"The office of the department will be at Trenton, N. J., and the operations of the same will commence February 1st, 1886, from which date applications will be received. The payment of contributions and the title to benefits will not commence until February 15th, 1886.

"Communications for information in regard to the relief department, and requests for blanks, etc., can be addressed to the superintendent at Trenton, N. J., from and after this date.

"It is desirable that superintendents, having fully informed themselves, should call together their officers and others who employ men and take up the subject fully with them, making such explanations as may be necessary, o the end that all shall become thoroughly familiar with the regulations."

Inquiries About Driver-Brakes.

THE following circular of inquiry has been sent out from the office of the secretary of the American Railway Master Mechanics' Association:

The driver-brake committee requests an early reply to the following queries, viz.:

1. Are there any circumstances under which you would recommend the application of driver-brakes, and if on all classes of engines, viz.: passenger, freight and switching?

2. What are the best substances, the best shape and best size of brake-blocks to be used on steel tires?

3. Does the application of driver-brakes lessen engine mileage between each tire turning, etc.? If so, to what extent?

4. Does their application lessen mileage between repairs that can be got out of journals, axle-boxes, horn-blocks and wedges, side-rod brasses, etc.?

5. Is any injury done to engine or side-rods by applying brake-blocks on one side only, and between wheels. (wedge type) thus forcing the axles further apart, or is there is a practical advantage in gripping each wheel with brake-blocks on both sides (compression type)?

6. Is it advantageous to couple driver, tender and train-brakes, so that one handle or valve will apply the whole?

7. Which is the best position for brake-blocks so as to give the greatest power and least interference with the elastic action of the main springs?

8. What percentage of the weight of the drivers is it judicious to utilize for brake resistance in view of the train breaking loose, and the possibility of the front (by the automatic application of the brake) being brought to a stop earller than the rear portion, thus resulting in a rear pitch-in?

9. Do you recommend the application of steam or other form of power-brake on drivers when the train is not provided with any form of continuous brake—or, in other words—is there any element of danger in having a powerful brake resistance at the front end of the train?

10. As there are several ways of applying brakes through an electric current, should the electric wire be so connected with the source of power that the touching of a button or key by the train conductor, would give him the opportunity of applying the brakes on the driving and tender-wheels as well as on the car-wheels?

Do not confine your answers to the above leading questions, but in addition kindly give any experience, information, statistics or opinions you may have on the general subject of the application of driver-brakes to locomotives either for or against.

On behalf of the committee,

H. A. WHITNEY,
Inter-Colonial Railway.
J. DAVIS BARNETT,
Grand Trunk Railway.

Replies to be addressed to J. Davis Barnett, Port Hope, Ontario, Canada.

Railway Progress in China.

MR. CHARLES SEYMOUR, United States Consul at Canton China, has circulated printed copies of the memorial presented last year to the Imperial Government of China, by the late Imperial Commissioner, Tso Tsung-Tang. The pamphlet is of value as an indication of the spirit of progress in China. On the subject of railways the commissioner dwells with force. He says: "Railroads must be modeled and built. In foreign countries. trade is the backbone of the state, and China is different from them in condition and circumstances. But railroads are built by the merchants, and military movements are benefitted by the roads. Transportation is facilitated and made expeditious, and wherever the railroad extends there benefits accrue. Before the railroads were made, many hindrances were thrown in their path, but when once they came into existence, the people on that account grew rich; countries became powerful, and goods imported were multipied. That there is every advantage and no detriment is only too obvious. The comments of the masses are multifarious, but there is no necessity to argue with them and explain everything. As the Analects have it, 'The people can be made to follow, but cannot be convinced.' Take, for instance, the telegraph and steam navigation—things China never had before; yet once they are initiated they become indispensable. If railways are introduced, the benefits that will be derived are of still wider scope. The memorialist is of the opinion that the first railroad should be laid from Tungchow to Ching-kiang-fu so as to connect the pivots of the north and south. Transportation

being made easy, the trade will become brisk and military movements being rendered expeditious the army may be reduced to a great degree. Besides, the cost of the road is only several millions; if shares are purchased by mandarins and merchants to make this road as an experiment, the plan can be carried into execution. Moreover, it interferes in no respect with the country and the livelihood of the people. When this road is a success it can be extended. A railroad for the northwest is especially inevitable in the future. The memorialist proposes that as soon as the minister for the board of marine is appointed, he is to be instructed to deliberate upon the subject, to devise methods for raising funds, to draw up proposals for carrying the plan into execution, and finally to report everything to the Throne."

Railways Across the Boundary.

ANOTHER effort will be made before the Canadian Parliament to obtain charters authorizing the construction of railways crossing the United States boundary west of Lake Superior. Up to the present time the Dominion Parliament has refused to grant any charter to build any railway designed to connect American railway lines with points to the Canadian northwest, and all such charters passed by the Manitoba legislature have been disallowed. The building of such lines has been regarded as a breach of contract with the Pacific Railway Company, as one of the conditions of the agreement with that company is that no competing railway line shall be allowed to be built for twenty years from 1881. Two years ago, when the bill granting to the Pacific Company an additional loan of $30,000,000 was before parliament, Sir Charles Tupper, then minister of railways, stated that as soon as the company had its line around Lake Superior the complete monopoly clause of the contract would not be insisted upon. Last session an effort was made to obtain a charter, but a new minister of railways, Mr. Hope, held that the Pacific Company's monopoly should not be interfered with until traffic over their road had been established. At the coming session power will be asked to build a railway from the international boundary, near St. Vincent, Minn., to Portage La Prairie, Manitoba, and another company will apply for a charter for a road from Brandon to Lake-in-the-Woods. It is expected that the government will oppose granting the charters.

Requirements of an Automatic Electric Block-Signal System.

GENERAL MANAGER McCREA, of the Pittsburgh, Cincinnati and St. Louis Railroad, gives the following as the requirements of an automatic electric block-signal system:

1. The system should be reliable beyond question, so that in case of trouble the responsibility can readily be placed.

2. The signals should indicate either "stop" or "go ahead," never cautionary, unless as a distant, indicative of a home signal in advance.

3. The signal in its "clear" position should indicate an entirely unobstructed track and should hold all conflicting signals to "danger," and lock all switches (if possible in the position to act as throw-offs) which, by being moved during the passage of a train running according to a signal, might either throw it from the track, divert it from the intended course, or allow another train moving in either direction to collide with it.

4. Semaphores should be used to govern running tracks. On roads which run to the right, the arm should point to the right of the direction in which the train is moving, and on roads which run to the left the reverse should be the case—this for the purpose that direction may be indicated. It is not in all cases possible to place the signals for the same direction on the same side of the track, consequently a disk signal, even if shielded on the back, cannot (unless by rule, or of a distinguished form, neither of which is hardly to be considered good practice) be made to indicate direction.

5. Pot signals should be made to govern sidings in order that as few signals as possible be displayed on the main running tracks, and again, that a short sight only be given, so as to compel an engineman while on any subordinate track to keep his train under complete control.

6. The current should hold the signal to "safety," so that in case of failure of the battery the signal would automatically indicate danger.

7. On a single-track the block section should so overlap that no two trains moving at speed in opposite directions should be allowed in adjoining sections to approach each other at the same time.

8. Provision should be made to indicate the position of all signals in adjacent block-sections to the train-order or telegraph office.

9. Atmospheric disturbances should be provided for so that in no case could an electric charge hold a signal at "safety."

Railway Accidents in Russia.

As is well known to readers of Russian works of travel, says *Engineering*, Russian railway traffic is worked with such slowness and care that accidents are less frequent than on the busier and quicker lines of western Europe. During the last few weeks a report has been issued by the minister of railways detailing the accidents that have occurred from 1880 up to the end of 1884. In 1880 the total was 434 killed and 675 wounded, which included 23 passengers killed and 68 wounded, 235 railway employés killed and 474 wounded, and "outsiders," 176 killed and 133 wounded; the latter category comprising persons killed or injured in traversing the lines at level crossings, etc. In 1881 the figures were: 24 passengers killed and 102 wounded, 198 employés killed and 459 wounded, and outsiders, 158 killed and 157 wounded; the total being 380 killed and 718 wounded. In the following year, 1882, occurred the famous landslip on the Moscow-Koursk Railway, when, owing to heavy rains and the smallness of the culvert, a huge embankment collapsed and buried a train which happened to be passing over it at the time. Hence the mortaiity among passengers was abnormally high, the total being 64 killed and 124 wounded. Among the employés the fatalities were 214 killed and 427 wounded, and among outsiders 170 killed and 166 wounded; the total being 448 killed and 717 wounded. In 1883, 23 passengers were killed and 78 wounded, 211

employés killed and 456 wounded, and 204 outsiders killed and 183 wounded; the total being 439 killed and 717 wounded. In 1884 the figures were: 25 passengers killed and 85 wounded, 170 employés killed and 387 wounded, and 223 outsiders killed and 182 wounded; the total being 420 killed and 654 wounded. From the above figures it will be seen that the annual average of the accidents on the 14,000 miles of Russian railways is about 420 killed and 700 woudded. Immense pains are taken by the ministry of railways to keep the list as low as possible, and in every case a searching investigation is instituted, and carelessness or negligence heavily punished.

Car-Axle Tests on the Pennsylvania.

THE Pennsylvania Railroad specifications for axles (adopted March 2nd, 1883) require that one extra axle be furnished with every hundred, for tests; the journals swagged, and axles centred. Passenger axles must be of steel, and rough turned throughout. Two test pieces are cut from an axle, ⅝ inch diameter and 2 inches long, which may be taken from any part of the axle provided the center line of the test section is 1 inch from center line of axle. It is required to show a tensile strength of 80,000 pounds per square inch; and an elongation of 20 per cent. If less than 75,000 pounds, or elongation below 15 per cent., or fractures irregular, the axles are not accepted. Steel freight-car axles must stand without fractures five blows at 20 feet of a 1,640-pound weight striking midway between supports 3 feet apart; axle turned over after each blow. Iron freight axles are to be hammered, and the iron must be double-rolled from muck-bar not exceeding ¾ inch thick; tough, fibrous, uniform, and free from scrap. Axle must stand without fracture three blows at 10 feet and two blows at 15 feet from same hammer and support as above.

Automatic Freight-Car Brake Tests.

THE following circular has been issued by the committee appointed by the Master Car-Builders' Association on the subject of freight-car brakes:

At a meeting of the committee of the Master-Car Builders' Association on freight-car brakes, held at Harrisburg, January 6th, 1886, it was decided to abandon the tests originally proposed, and in lieu to invite the manufacturers of freight-car brakes to competitive tests to be held at Burlington, Iowa, July 13th, 1886, and April, 1887, under the following conditions:

1. Each brake company will furnish, fitted with its brake, fifty 30-foot or 34-foot box-cars of 40,000 pounds capacity; 34-foot cars being preferred. Each car to be equipped with brakes on both trucks, and plain cast iron shoes. The cars to be delivered to the committee free of charge at some point on the Chicago, Burlington and Quincy Railroad on or before July 7th, 1886.

2. The first test will take place at Burlington, Iowa, on the Chicago, Burlington and Quincy Railroad on July 13th, 1886. After this trial, the cars will be returned to the owners at the point of delivery, and put into general service.

3. An endurance test under the supervision of the roads owning the cars will then take place. A careful record of the cost of all repairs to brakes will be kept except as regards the foundation brake (beams, shoes, blocks, hangers and brake-levers.) The mileage of cars while undergoing this endurance test will be kept as far as practicable, and all brakes are to be kept in constant use until the second test in April, 1887.

4. In April, 1887, the cars will be returned to Burlington, and without being prepared for trial the July tests will be repeated.

5. Two similar eight-wheel freight-engines will be employed in the Burlington tests. These engines have 17 by 24-inch cylinders and not less than 51,000 pounds on the drivers, one engine to be equipped with the Westinghouse driver-brake and the other with the Eames vacuum driver-brake. Both tender-trucks to be fitted with brakes, plain wrought iron shoes to be used on engines; each brake company to have the option of selecting either of these engines for use in the trial of their brake.

6. The Chicago, Burlington and Quincy Railroad will not be held responsible for mileage of cars while on its lines, nor for any damage to the cars that may occur through the inefficiency of the brake.

7. Three or more competitors will be required before the tests will be entered into. Any competitor desiring to enter the tests should communicate with the chairmain on or before April 1st, recommending any features of device that should be brought out during the trials. The committee, prior to May 1st, will hold a meeting to formulate the rules governing the tests, of which each competitor who has signified his intention of entering the tests will be apprised. Competitors will be required to submit to all tests that are decided upon by the committee. The committee are not in a position to provide equipment for these tests, but regard the subject as of great interest to railroad companies, and trust they will contribute to its success by furnishing cars to the competing brake companies, and afford them any other reasonable facilities.

G. W. RHODES,
W. T. HILDRUP,
JOHN S. LENTZ,
Committee.

The Nuisance of Whistling.

WITH regard to the whistling of locomotives at crossings the report of the Massachusetts Railroad Commission, just issued, says: "Four petitions have been acted on, and whistling has been forbidden at the several crossings covered by these petitions. The board believes that this legislation is wise. They agree with their predecessors in holding that the value of the whistle as a danger-signal is impaired by its constant use as a mere crossing-signal; that such use inflicts a heavy penalty upon the innocent to protect the reckless and undeserving, and that at many crossings the whistle is simply a useless annoyance. It is not improbable that fatal accidents will occur at some of the crossings where whistling is now dispensed with. Indeed, it is certain that at some time they will occur, for such fatalities have happened, from time to time, when whistling was permitted; and its cessation will not relieve careless people from danger. But such accidents will not disprove the wisdom of the law. If the natural horror arising from the occurence of a fatal casualty should ever lead to a condemnation of the statute and to a demand for its repeal, it should be remembered that the benefits of the law are constant, although they are not visible; that no law can always shield men from the results of their own recklessness, and that a highway crossing accident is almost impossible under any state of law, if travelers will use ordinary care."

Report of the New York Railroad Commissioners for 1885.

THE third annual report of the Board of Railroad Commissioners of the State of New York for the fiscal year ending September 30th, 1885, is a large and complete octavo volume of 641 pages. Apart from the usual statistical matter which is found in such reports, and which on this occasion is full and accurate, the report is furnished with a valuable appendix containing the general railroad law, and a classification of all law relating to the railways of the state. The report shows that an enormous business was done on the railways of the state notwithstanding the unprofitable rates, the gross earnings being $111,632,961.47, as against $120,227,871.72 the year before. The operating expenses were about $6,000,000 less than in 1884. There was a great diminution in the number of accidents, there being only 13 passengers killed and 90

injured. In 1884 there were 25 killed and in 1883, 40. One hundred and thirty-seven employés were killed and 771 injured, while 261 other persons suffered accidental deaths. The report says: "Probably for the first time since railways have been run within the state of New York can it be said that a year has elapsed without a single passenger being killed from causes beyond his own control. Such was the fact for the fiscal year ending September 30th, 1885." The physical condition of the railways has greatly improved within the last two years. The following is an outline of the report, showing a few of the grand totals:

	1884.	1885.
Gross earnings	$11,632,961	$120,227,871
Operating expenses	77,125,826	83,240.858
Net earnings	34,457,135	36,987,013
Income other sources	6,244,808	6,237,025
Interest*	24,644,451	26,817,711
Taxes	4,874,334	4,640,323
Dividends*	10,455,865	17,946,259
Deficit	3,502,337	10,471,322
Stock and debt	1,292,395,622	1,271,380,638
Cost roads and equipment	1,175,948,966	1,163,905,127
Percentage gross income to cost	3.46	3.70
Percentage net income to cost	1.09	1.18
Percentage dividends to stock	1.60	2.76
Miles of road built	7,311.40	7,317.04
Tons of freight carried one mile	9,902,683,295	9,326,068,865
Increase in 1885 of 6.18 per cent.		
Average freight earnings per ton per mile (cents)	0.73	0.83
Average passenger earnings per passenger mile (cents)	2.16	2.42

*Includes, respectively, interest and dividends paid by lessors from rentals received from lessees, as follows: Interest, 1885, $5,031,909; 1884, $3,-827,045. Dividends, 1885, $3,427,453; 1884, $3,308,472.

An Anecdote of General McClellan's Railway Days.

IT is said that soon after taking charge of the Ohio and Mississippi road General McClellan issued an order whereby a passenger without a ticket or fare was to be backed up to the station from where he came and put off there. This was in accordance with a West Point sense of justice, however impracticable from a railway standpoint. One day a passenger who claimed to have gotten on at East St. Louis was not discovered until the train was whirling for Vincennes. "Little Mac" happened to be aboard, and the facts were reported to him by the conductor. The situation was awkward, but he was equal to the emergency. Drawing out his watch he said: "The south-bound express is due in an hour-and-a-half. Never mind backing down—I'll give him a pass back to East St. Louis."

Poppies for Railway Road-Beds.

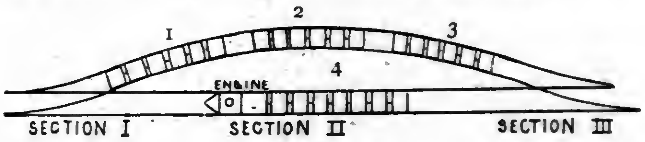
THE chief roadmaster to the French Government railways has made the interesting discovery that the best plant yet discovered for consolidating the loose soil of a newly made embankment by the interlacing of its roots is the double poppy. The ordinary grasses or clovers employed for the purpose required, he says, several months for the development of their comparatively feeble roots, while the double poppy germinates in a few days, and at the end of three or months its roots are a foot long and tightly interlaced. The plant is an annual, but it sows itself after the first year. In France it is among the hardiest of the common plants.

The Proposed Ship Canal Across Ireland.

THE proposed ship canal across Ireland would be 127 miles in length, and would contain thirty locks. For ships of 1,500 tons the cost would be $40,000,000; for ships of 2,000 tons, $60,000,000, and for ships of 5,000 tons and upwards, $100,000,000. If built on this scale the canal would be 200 feet wide on the surface and 100 feet at the bottom. The passage through the canal would be effected by a system of towage, and it is estimated that the passage of a ship from Galway Bay to Kingstown would occupy between twenty-four and thirty-six hours.

Another Problem in Switching and Car-Drilling.

ANOTHER problem in switching and drilling cars is here given the readers of the JOURNAL for solution. Like the one published in the December number this problem was presented in actual practice on one of the leading roads of the country and was solved at the time.



The siding is entirely occupied by three trains, each containing a number of cars, which trains are numbered 1, 2 and 3. The locomotive is standing on section II of the track with a train of a number of cars, which train is numbered 4. The locomotive can move but one train at a time.

Problem: To transpose trains 2 and 4, leaving trains 1 and 3 in their original positions, and without making flying switches.

RAILWAY servants seem to have a better chance in New South Wales than in England, says an English exchange. There the railways are in the hands of the government, and there exists a regular system of promotion from the lower ranks, which often prevents new comers readily obtaining employment, unless possessing exceptional qualifications, the humblest servant having a chance of rising by steadiness and ability to the leading positions in his department.

THE cost to the State of New Jersey of defending the railway tax suits has just been made public by the Attorney General as follows: Counsel fees, $18,439.83; engineer and expert testimony, $15,138.91; printing returns to writs, testimony, briefs, etc., $5,196.60; fees to masters, courts, stenographers and other expenses of taking testimony, $4,403.27; total, $43,178.61.

IT is stated that a prominent business house at Metamoras, Mexico, has received notice from their London correspondent that the Mexican National Construction Company has borrowed money from Matthiesen & Co., of London, to continue the construction of that road, and that work will be resumed inside of three months.

THE heaviest locomotive of which there is any record is a passenger tank-engine of the Pennsylvania Railroad. Its weight is stated to be 120,000 pounds, but the driving-wheel is only 60 inches in diameter. The fast express engines on the same road have driving-wheels 78 inches in diameter.

ONE-FIFTH of all the coal produced in the United States is found in four counties, of which Pittsburgh is the business center. Nearly one-third of the product is converted into coke. There are 100 coke-makers, 12,000 ovens, and $13,000,000 invested. Six thousand men are employed.

American Railroad Journal.

A MONTHLY MAGAZINE AND REVIEW.

(ESTABLISHED IN 1831.)

PUBLISHED AT No. 323 PEARL STREET, NEW YORK.

J. Bruen Miller, ... Editor.

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NEW YORK, FEBRUARY, 1886.

Principal Contents of this Number.

RAILWAY RELIEF ASSOCIATIONS.

ELSEWHERE in our columns is given a full description of the newly-created relief department of the Pennsylvania Railroad, which has been in operation since the first of this month. A perusal of the various regulations and provisions will show that the management of the road has devoted careful study to the subject and has honestly endeavored to provide a satisfactory system for the relief of the employés of the road in cast of disability or sickness, and for relief to their families in case of death. The system is intended to reach 40,000 employés, and with their families nearly 200,000 persons will be benefited by the regulations of the relief department. With the general operation of the system no fault can be found. It is wisely conceived and equitable treatment is assured every benefiiciary. The small payments which the members are to make for the maintenance of the department have been classified in such manner that the benefits of the system are within the reach of all, and it is not to be questioned that the finances of the department will be admirably and irreproachably managed. In every detail there is the sign of careful forethought and deliberation.

And yet the employés do not appear to enter with unanimous zeal into the spirit of the undertaking. Considerable complaint is made that the road is forcing its employés into a system of mutual benefit which does not appeal to them as the best that could be devised. It is stated that the employés themselves are and have been contributors to a beneficiary fund of their own and that the labors of the management is a work of supererogation. Judging by the utterances of a number of the Pennsylvania's employés publicly made in the daily papers, the management of the road has not received thanks for its efforts in behalf of its subordinates—efforts that certainly were entirely unselfish.

Perhaps for this state of affairs the much-vaunted American trait of independence is in great part responsible. The average railway employé in an intelligent man and a member of that proud class known as skilled labor. In no other class of persons is to be found a greater willingness to assist unfortunate bretheren or a more unselfish generosity. Mutual benefit associations flourish among this class to a marvelous extent and are blessed with a prosperity that is envied by strictly business organizations designed to effect similar results. There is an *esprit de corps* among the railway employés which is rigidly and proudly maintained. But the railway employés desire to control the associations and relief departments themselves. They wish to feel that they alone are responsible for the proper workings of the organizations and that they alone are benefiting their unfortunate coworkers. Any supervision on the part of the management of a road is thought to be an unwarrantable intrusion, and

the relief accorded under these circumstances is felt to partake of an eleemosynary character.

Independence is a noble trait, but like many other very noble traits it is liable to work mischief if unrestrained. No man who works for wage is independent, from the President of the United States down to the humblest laborer. He is answerable to somebody and is responsible for the proper performance of his duties. The pride of the employés in being their own financial managers is a foolish pride. It can hardly be expected that they can as skillfully control the receipt and disbursement of large sums of money, in the aggregate, as men who by training and experience are expressly fitted for such duties. Nor do we believe that they would themselves lay claim to equal capacity for such duties. But they love the feeling of independence, and the prosperity of their relief asssociations are matters of personal pride to their managers. Under the circumstances we are not surprised that the organization of the Pennsylvania's relief department has been rather cooly received by its intended beneficiaries, and simply for the reason that the employés were not consulted. Had the management of the road sought a conference with its employés, submitted its present plan of relief and requested their coöperation, it would doubtless have been accorded; but this omission has aroused a feeling of antipathy to the proposed system.

It is highly probable that ultimately all opposition to the Pennsylvania's relief department will vanish, and that it will result in incalulable benefit to the employés of that vast railway system controlled by the corporation; but other roads may learn a little lesson from the discontent which the official circular of the management has aroused. In aiding employés the surest way to gain appreciation is to secure coöperation, and to obtain the latter the impression should be conveyed that the aid is self-given. Nine times out of ten the employés of a road would willingly adopt any fair system of mutual relief that the management might submit; but they desire to be consulted, and to that extent they are perhaps justifiable. In so doing the management would minister to the pride of its subordinates, it is true, but a proper pride—the pride of manly self-reliance.

"HERE'S A STATE OF THINGS!"

THE New Jersey legislature has adopted a resolution denying the right of the United States to give permission for the building of a bridge across Staten Island sound, or rather claiming that the permission of congress alone is not sufficient, the sovereign state of New Jersey having the final say in the matter. In fact, to judge by some of the printed utterances of the New Jersey legislators, there will sooner be war and secession than a surrender of the statal rights. But all the same the conviction is dawning that the bridge will ultimately be built. In all probability the original locality selected will be abandoned and the bridge constructed at a point where it will less interfere with navigation; but it is doubtful if the project will be defeated even with the powerful opposition now arrayed against it. And thereafter Jerseymen will continue to curse forever and forever the memory of those sweetly innocent commissioners who ceded Staten Island to New York when by every law of geography and common-sense it clearly belonged to New Jersey. And to add to the complexities of New Jersey legislation the supreme court of that state has just decided that the Railroad Tax Bill of 1884 is unconstitutional, and the state is thus left without money in its treasury and with the necessity of refunding the large sums collected from the railways during the past year. Truly poor Jersey is beset with difficulties.

RAILWAY CONSTRUCTION IN THE SOUTH.

AMID the general depression which has characterized railway construction in this country for the past two years, it is encouraging to note that in the south railway enterprise has steadily been developing. During the year just passed, 727 miles of new road were constructed in the southern states, or one-fourth of the total yearly construction of the country. In the past five years there has been an increase of railway construction in the south of 9,323 miles, a favorable comparison with any of the great sections of the country, and this enterprise has been carried through by a hitherto stagnant division of the nation. The new construction in Virginia during these five years has been nearly 800 miles, a construction exceeded during the same period in two states only—Texas and Arkansas. In relation to increase of population undoubtedly the southern states have taken the lead in railway construction; and this is as it should be. For twenty years enterprise of all kind has lain dormant in the south, and southern railways have been the synonym for lack of progress, discomfort and general inanition. It is evident that the old south has at last awakened and that its great resources are to be vigorously utilized.

And it is in the south that railway construction can safely be pushed and encouraged. There it can be developed without fear of undue competition, paralleling, and consequent bankruptcy. Under the new conditions that have arisen since the war, the south is a vastly different section of country from what it was in ante-bellum days. The planter has given place to the manufacturer; northern capital is seeking investment in southern industries, and northern enterprise has demanded greater facilities for transportation. Awakened from the apathy which seized him upon the surrender of Lee and the utter anni-

hilation of the hopes of the Confederacy, the southerner has again taken up his citizenship in the United States, and is seeking in the only sensible way to regain what he lost in the unhappy struggle. The abolition of slavery has, too, introduced the feature of competition in southern labor, and practically the south is a new and undeveloped land. Its resources are great. There is scarcely an industry that cannot be introduced under auspices that will insure its success, and the true mettle of the southerner is rapidly asserting itself. Under all these circumstances there is a loud and imperative demand for railway construction in that fertile section of the country, and the call is being heeded. Of course the matter can be overdone, but there is a vast amount of new construction yet to be accomplished in the south before there is a glut of railway facilities—which unfortunately is not the case in the north—and the eye of the railway capitalist and investor is turned to that long abandoned section as the likeliest field for profitable investment.

EDITORIAL NOTES.

CERTAINLY a recent spectacle in the assembly chamber at Albany was not creditable to legislative honor. Upon an announcement from the clerk, our worthy assemblymen flocked like sheep to the fore and received passes from certain railways of the state. The legislative pass is a stumbling-block in the way of honest legislation and we incline to the belief that the best plan is that pursued in New Jersey. There, certain state officials and members of the legislature are entitled to passes as a matter of right, and in receiving them they are under no obligations to the corporations. And yet with all this it is sometimes hinted that the railways have occasionally influenced legislation in New Jersey.

* * *

DURING the past year, forty-four railway companies in this country passed into the control of the courts. A mileage was here represented of 8,386, debts of $198,000,000, and a capital stock of $187,000,000. This is not a very cheerful record, and its cheerfulness is not enhanced by the fact that the vast interests of these roads are to be controlled by receivers. The railway receiver is not in very good flavor at present, and as an institution he is not popular.

* * *

FROM statistics gathered by Mr. EDWARD ATKINSON, it is shown that the railway property of the United States comprises one-fifth of the accumulated capital of the country, that it gives employment to 650,000 people, and that it annually moves 400,000,000 tons of freight, one-half of which is fuel and food. It is further shown that so cheaply is this freight transported that the Massachusetts mechanic can procure the transportation of one year's supply of food from a distance of 1,000 miles for a single day's wages. After weighing these cold facts carefully, and gathering their full import, no one can wish for a return of the "good old days" when the sound of the locomotive whistle was not heard in the land.

THE February *Century*, the "midwinter number," continues its war series in three interesting illustrated articles: "Preparing for the Wilderness Campaign," from the personal memoirs of General Grant; "Our March Against Pope," by General Longstreet, and "With Jackson's Foot-Cavalry at the Second Manassas," by Allen G. Redwood. In addition there are a number of valuable memoranda of the civil war by prominent officers. Henry Eckford contributes a paper on Antoine Louis Barye, beautifully illustrated, and Mrs. Schuyler Van Rensselaer, the fifth of the illustrated series on "Recent Architecture in America," the subject being "City Dwellings." Among the open letters of this issue is an interesting correspondence from a number of leading authors on the subject of "International Copyright." Altogether the "midwinter number" is an exceptionally strong one.

"CHESTS and Cabinets," by J. Hungerford Pollen; "An Atelier des Dames," by E. Œ. Somerville, and "Art in Persia," by William Holmden, are among the illustrated articles in Cassell's *Magazine of Art* for March. The number is an exceedingly interesting one. *The Quiver* and the *Family Magazine*, issued by the same house, are also excellent numbers. Messrs. Cassell & Co. have recently inaugurated a cheap library of standard works known as the *National Library*, and edited by Prof. Henry Morley. The first of the series, "My Ten Years' Imprisonment," by Silvio Pellico, translated from the Italian by Thomas Roscoe, has been issued and is sold for ten cents.

THE first number of *Outing* since its removal to New York is an excellent one and contains a number of interesting contributions and spirited illustrations. Commencing with the March number, Mr. Theodore Roosevelt, the well-known ex-assemblyman of this city, will contribute a series of articles on "Big Game Shooting in the Rockies," which will be fully illustrated. With the March issue Mr. Poultney Bigelow assumes editorial charge of the publication.

Railway Life, a weekly journal devoted to Canadian railway interests, has appeared in Toronto, Ont., and the railway press of this country can well afford to welcome a contemporary across the border. The first issue is an excellent one, and its success should be assured. The subscription price is $2 per year.

THE eighth annual report of the Board of Commissioners of the State of Iowa is received and shows that they have been painstaking in collecting their information, which is contained in a volumne of 608 pages. A brief outline of the report was published in the January JOURNAL.

THE printed report of the nineteenth annual convention of the Master Car-Builders' Association, at Old Point Comfort, Va., June 9th–12th last, has been received.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.
First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.
Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.
Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.
Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.
Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.
The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

STREET-RAILWAY FRANCHISES.

THE bestowal of franchises for the operation of street-railways through the streets of a city is a subject which is attracting considerable attention. Ordinarily there are three ways in which franchises are granted, and two of them are open to objections. There is the franchise granted in consideration of a definite payment in cash to the municipality; another granted in consideration of an annual payment of a certain per cent. of the earnings, and still another where the grantees of the franchise assure a definite percentage of the earnings in addition to a definite sum paid upon the receipt of the franchise. Possibly none of these methods are wholly without objection, but at present public opinion seems to to indicate that the second method is the best. And we take the liberty of differing from public opinion. It is an easy thing to assure a percentage of the earnings to the city, and any irresponsible parties can rush into a street-railway speculation when the only prerequisite is an assurance of a payment of a certain portion of their receipts. When it comes to the absolute payment of a definite sum into the city's treasury there is likely to be greater deliberation, and the enterprise will not be undertaken except with the determination to operate the road as energetically as possible. Of course in the payment of this sum there is the probability that the city will bestow the franchise for less than it is worth, and, therefore, the third method offers a safeguard to avert this probable underselling. The cash payment is a guarantee of good faith, and the payment in addition of a certain percentage of the earnings is the city's profits. Decidedly we should say that the latter method was the most desirable of the three.

In the manner of sale of franchises there is also a strong feeling that they should be put up at public auction and sold to the highest bidder, which seems right enough on its face; but in so doing the city should reserve the right to reject any or all bids if it is deemed best in the interest of the public so to do. The purchasers of a street-railway franchise should be persons whose names inspire confidence that the road will be well managed, and a definite period should be fixed within which the road should be put in operation. By this means mere speculators would be discouraged and the "freezing out" of a legitimate bidder rendered impossible. It is of the highest importance to a city that its street-railways shall be well managed, for poorly managed and equipped roads are a detriment to municipal prosperity. A guarantee of good management cannot be assured by a long purse alone, and the unrestricted sale of a franchise to the highest bidder, irrespective of the latter's standing and responsibility, is not likely to prove productive of the best results.

GRADUALLY the mystery surrounding the granting of the franchise of the Broadway surface road is being unravelled, and there is reason to believe that the committee on railroads of the New York senate, which has the investigation of the matter in charge, is composed of very different timber from the famous GIBBS committee with its great cry and little wool. As we said before, the fullest light thrown on this deep subject is highly desirable both on grounds of public honor and in the interesfs of street-railways. Putting aside the question of morality which enters into the subject, in the end street-railways would find it far more costly to secure franchises through bribery than by legitimate and above-board means.

DANGERS OF THE CABLE SYSTEM.

BY W. W. HANSCOM, M. E.
[Written for the AMERICAN RAILROAD JOURNAL.]

IT seems proper that in the operation of any system of transit for people, a knowledge of the dangers pertaining to that system should be known and intelligently discussed in order that, if possible, they may be eliminated. If this is not entirely practicable such means should be provided as will lessen the dangers to the greatest possible extent, and the public be informed so that it may not contribute to any injury which might occur. The corporations which operate such a system should also give to the travelers such information as will enable them to exercise prudence when either riding or passing in the vicinity of trains either stationary or in motion.

This article is called forth by an item in the *American Machinist*, of November 21st, 1885, referring to an accident which occurred in Philadelphia on the cable road in that city. It is stated that "one of the grips became entangled, the grip-man was unable to release it, and the result was that the motor to which it was attached came in collision with a transfer-car drawn by horses which passes over a part of the cable road between Fortieth and and Forty-first streets on Market, and seriously injured four persons, killing two horses attached to the transfer-car, and damaging a number of motor-cars as well as the transfer-car."

From the experience which the cable road companies

in San Francisco have had, it seems probable that the immediate cause of the entanglement of the cable with the grip, was an uneveness in the cable, due to a part of one of the strands of the cable being loosened and the end of the strand, being gradually drawn out, projecting sufficiently so that it would not pass through the jaws of the grip when the car was standing still and the cable was moving; the result being that as the projecting end of the strand struck the grip, refusing to pass through the grip, it would be held while the rest of the strands would pass, and this strand would be stripped along the cable forming a bunch of coils around the rest of the cable until the resistance would be sufficient to start the car and keep it moving with the speed of the cable until notice could be given at the engine-house and the cable be stopped; or, as was the case, persons were seriously injured and much damage done before the cable could break away from the grip and with its accumulated bunch of "strand" pass into the engine-house where it would be seen and stopped. It may be easily shown how the bunch is formed by taking a piece of twine and loosening one strand and pushing this strand along the rest, as is sometimes done in trying to separate one strand.

In the operation of cable roads the danger lies in the fact that, as the cable is always moving while the cars are on the street, and also while they are stopped for the taking up or letting down of passengers, many people would naturally cross in front of a stationary car supposing entire safety in so doing, while those driving teams under the same idea would, when the car is moving—kowing the ease with which the car can be stopped ordinarily—not hurry in getting off track when going in front and in the same direction as the car.

While this condition of affairs is fraught with much danger to the public, it can so easily be avoided that its occurrence would be exceedingly rare except under extraordinary circumstances over which the cable road company might be excused from having control.

In the manufacture of the cables for roads they are made of such a length that only one splice in the length of each cable entering the engine-room is required. The splice usually requires a length of from one hundred to one hundred and twenty feet, and the ends of the strands are not all of the same length; thus one strand being one hundred feet long, the next would be eight or ten feet shorter and so on, the object being to make the diameter of the cable at the splice uniform with the rest of the cable. For a few feet where the ends of the strands come, the hemp-core of the cable is taken out and the strand tucked in its place, so that the surrounding strand protects the end of the strand which has been tucked into the center from abrasion by the jaws of the grip as the cable passes through it. Sometimes in making this splice the end is not properly tucked, and in time the end of the strand works out from the center through the other strands surrounding it, and gradually projects above the others until it cannot pass through the grip, and it is caught, resulting in more or less injury and damage to persons and property.

When cables were first used for street-roads in San Francisco, such experiences were had (fortunately without injury to persons) of the "stranding" of cables until continued use and increasing knowledge indicated that the life of a cable for safety could be exhausted without any stranding. At first the constant attention which seemed necessary was onerous, but the habit became almost a second nature, and now and for years past constant familiarity with and care of cables have educated so many that the slightest unusual appearance of the cable is instantly noted and attended to without any apparent forethought, and now no stranding can occur without criminal negligence.

In the early days of cable roads ideas of economy induced the use of cables where appearances indicated that they were liable to give out or "strand" at any time, but now these ideas have been banished and the life of the cables are limited to a known condition of safety from such accidents as lately occurred in Philadelphia.

When cable roads are properly constructed and are efficiently supervised, the accidents and injury to travelers and others are, it is believed, less than by any other means in use for transit.

DISEASES COMMON TO CAR-HORSES AND THEIR TREATMENT.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

RECOGNIZING the fact that an essay upon the important subject assigned your committee should emanate from one versed in the treatment of equine diseases, and desiring to present a report worthy your careful consideration, we, at an early date after receiving notice of our appointment, arranged with Dr. W. H. Arrowsmith, of Jersey City, a graduate of the American Veterinary College, of New York, to prepare an article on "Diseases Common to Car-Horses and Their Treatment." To treat of all diseases common to car-horses would occupy too much of the time of the association; we have, therefore, restricted this article to glanders, pneumonia, colics and cerebro-spinal meningitis.

The paper as prepared we have carefully revised and now submit for your consideration.

C. B. THURSTON, } *Committee.*
JAMES K. LAKE, }

SOME OF THE DISEASES INCIDENT TO CAR-HORSES.

It will not be the object of this essay to consider all the diseases that are to be met with in surface railroad stables, but to review some of the most frequent and fatal diseases, to explain their causes, symptoms, pathology, and most rational treatment; to advise in regard to their contagiousness, their diagnosis, and what prophylactic measures may be used to prevent, and what methods may be employed to impede their progress.

We will first consider the disease known as

GLANDERS, OR FARCY,

a disease which is not only fatal to horses, but also fatal and innoculable to man and other animals.

Glanders is a purely infectio-contagious disease, due to a specific germ or virus, the local manifestations of which are peculiar cancers or ulcers on the mucous membrane of the nose, with a viscid purulent discharge, ulceration of the mucous membrane, of the sinuses of the head larynx and traches, tubercles and ulcers in the lungs,

suppurating ulcers upon the skin and within the connective tissues, and which are known *farcy buds*, and enlargement and induration of the lymphatic vessels and glands of the body.

Glanders was known and described as early as the fourth century, A. D., and again in the sixteenth century; it was described by writers on veterinary subjects to be the cause of syphilis in man from the fact that glanders appeared among the horses at the same time, and caused as much havoc as did syphilis among the soldiers at the famous siege of Naples.

But among all the early writers none were familiar with the true pathology of the disease. Some looked to the head, the lungs, and the stomach as its seat; others asserted that it did not extend beyond the pituitary membrane of the nose; and it was not till the latter part of the seventeenth century that the contagiousness of the disease began to be questioned. In the early part of this century, although the contagiousness of the disease was acknowledged, still the opinion was held that it appeared only among those horses that were poorly fed and watered; that were required to undergo severe exertions upon insufficient food, and that were stabled in buildings that were poorly ventilated and drained, and where all care to hygiene had been neglected; and it was not till 1868, that it was without doubt proven by Gerlach to be of a strictly infectious and contagious nature.

Glanders is due to a virus or germ which is both transmissible and fixed. This specific infecting germ or virus exists in the various secretions and fluids of the body, and which when taken into a healthy organism will produce glanders.

Certain discharges and secretions from the affected animal apparently contain the virus in a more virulent form, thus: The virus from the nasal or the discharge from any cancer or *farcy bud* on the body, when taken into the system of a healthy animal seems to act with greater potency than does that from the blood, urine, perspiration or excreta; still innoculations from any of the secretions will produce glanders.

Glanders cannot be produced spontaneously; nor are there any influences, bad hygiene, overwork, improper feeding, or any other cause capable of producing the disease apart from the infecting virus, although the above conditions are predisposing. It is a purely infectious and contagious disease; were it so that the disease could be produced apart from its peculiar specific contagion, more than half the horses in our railroad stables, and all the horses among the poorer class of horse-owners, would be affected with the disease. Glanders is transmissible to man, and to all domesticated animals except cattle.

Both practical and experimental experience sufficiently proves that the virus of glanders is a transmissable and fixed principle. Whatever material, be it harness, cribs, bedding, or some stable utensil, that become polluted with the discharge from the nasal cavities or secretions from the cutaneous ulcers, will retain the dangerous properties for a long time, and will act as a source of contagion. Again experiments have fully proven that the perspiration or the expired air from the lungs of an affected horse will readily produce the disease.

Not every animal exposed to the infecting virus contracts the disease. Out of 138 horses that were caused to stand among diseased ones, using the same utensils and working in the same harness, only 29 became affected.

Glanders may be described as *acute* and *chronic* according to its duration; and, according to its seat of local manifestation, as *nasal, pulmonary* and *cutaneous*, or commonly known as *farcy*. Glanders, as in other infectious diseases, has a period of incubation which may exist from five days to as many months, and in the chronic form there is a period of apparent latentcy which may exist for months or even years.

The symptoms of acute glanders are ushered in by a chill and more or less fever, accelerated pulse and anorexia; there will be present a hyperæmia and tumefaction of the mucous membrane of the nasal cavity and at times a slight epistaxis. On the third or fourth day small nodules appear, and a diffuse, yellowish infiltration takes place in the mucous membrane of the nose, with a slight discharge which at first is thin, viscid and contains but few cellular elements, but in a day or so it becomes thicker, more viscid and of a peculiar yellowish green color, and adheres more or less to the lips of the nostrils.

The nodules soon break down and resemble small round ulcers, with swollen and ragged edges; these extend by the formation of other nodules and frequently coalesce, and give rise to an extensive ulcerated surface, with an uneven and irregular edge; these ulcers may often be seen upon the median septum of the nose by raising the alæ of the nostrils with the thumb, and looking upward into the nostrils. The discharge is often limited to one side, particularly the left, for which we offer no explanation.

The sub-maxillary glands become swollen and indurated and attached to the maxillary bone, the respiration becomes labored, the temperature increased, the appetite entirely gone, the legs, sheath and sub-abdominal region become swollen and infiltrated, the characteristic farcy buds appear on the different parts of the body, especially on the inside of the hind limbs; the lymphatics of the entire body become indurated, and with the progress of the disease the discharge from the nose becomes more profuse, diarrhœa frequently sets in and if the animal is not destroyed it dies a miserable death in from eight to fifteen days from the time of its first appearauce. These symptons of acute glanders may follow directly on infection or innoculation, but is most frequently the conclusion of the *chronic form* of glanders.

CHRONIC GLANDERS,

or, as it is sometimes designated, *pulmonary glanders*, may exist for months and even years without any outward signs which could at once be considered as pathagnomonic.

In this form of glanders there is a dry, wheezing cough, with retarded respiration, emaciated condition of the animal's body, hair staring, appetite variable, and the temperature and pulse may be slightly or not at all increased. There may or may not be a discharge from the nostrils; the glands of one or either side intermaxillary space may be nodulated. The ulcers may be wanting in the nostrils and in some cases ulcers are never found, the visible mucous membrane are pale in color and there are occasional attacks of diabetes and diarrhœa.

In other cases of *chronic* glanders, there is the same

unthrifty condition of the animal's body, there is a tendency to shiver on the slightest cold; there is a discharge from one or both nostrils, at times tinged with blood, and upon the mucous membrane of the nasal cavity may be seen small pit-like ulcers. These ulcers are very characteristic; they are excavations of varying size, from that of a three-cent piece to that of a dollar, with irregular and ragged edges. They are developed from small elevations or cells, which lie beneath the mucous membrane of the septum nasi, and present to the touch the feeling of a mustard seed beneath the skin. From each of these small elevations a minute yellowish central point is developed, with a small transparent ring about it, and beyond that red inflamed tissue; these central points or neoplastic growths soon break down and discharge their contents, the mucous membrane between them sloughs away and there is left the ragged ulcerous sores, their edges presenting the appearance of a membrane everted, with the tissue in the center granulating, and discharging an ichorous, viscid fluid with an offensive odor. These ulcers frequently continue to undergo a destructive metamorphosis and will in some cases penetrate the septum and form a ragged, discharging hole. In other cases they will take on a reparative process and leave an irregular cicatrix. The glands in the inter-maxillary space become hard and adherent to the maxillary bones; these hardened glands may be unilateral, corresponding to the side upon which there are lesions in the nasal cavity, or they may appear on both sides. These glands at first present an inflammatory action—they are hot, painful, swollen, and soft in character—but instead of undergoing the usual inflammatory process of glandular structures they become hard and firmly attached to the adjacent tissue, and the maxillary bone.

FARCY,

which is the name for the cutaneous manifestitation of glanders, which is not a distinct disease as is sometimes stated, may be described as *acute* and *chronic*.

The symptons of acute farcy are general or constitutional, and local or diagnostic. The general symptoms are a loss of or impairment of the functions of health, high temperature, accelerated respiration and quickened pulse. The local symptons are a general œdema of the limbs, with heat and pain, and at times lameness; this œdema may subside and there will be noticed circumscribed swellings, following each other and taking the direction of the blood vessels, and lymphatics of the limbs; from these nodulated swellings appear the specific nodules or *farcy buds*. These nodules or ulcers are situated in the cuticle and subcutaneous tissue, and undergo the the same process as do the ulcers or cancers in the nose. Histologically considered these ulcers of the skin are the same as those found in the nose and lungs. These cutaneous ulcers are developed from the nodulated swellings which appear along the legs; they vary in size and soon the central position softens and ruptures, and a grayish-white liquid somewhat sanguinous and of a foul odor is discharged, leaving a deep, pit-like, ragged edge, and which is not disposed to heal. These buds or ulcers frequently undergo rapid disintegration and coalesce with each other, and form a large irregular-edged ulcer, which continues to discharge a viscid, purulent, blood-stained fluid. These ulcers not only develop on the legs, but in advanced cases are to be met with on any part of the body.

Lymphatics and lymph glands of the adjacent tissues become enlarged, swollen and painful upon manipulation, but they seldom undergo suppuration. The fever is of a remittent character, but the pulse remains accelerated. The animal undergoes a rapid emaciation and prostration, and not infrequently all the symptons of acute nasal glanders is developed and the animal succumbs to the disease.

The acute form of glanders and farcy are not so often met with as the chronic forms.

CHRONIC FARCY,

is the most common form of glanders. Its diagnostic symptoms are often vague. There is little or no rise in temperature, and seldom any functional derangement; at times there may be a capricious and depraved appetite, a want of general vigor, but its diagnosis depends chiefly on its local symptoms and these are circumscribed swellings and *buds*, or ulcers on the skin and subjacent tissue. These ulcers and swellings are similar to those described in acute farcy, but they are more distributed over different parts of the body, and are to be encountered on those portions of the skin that are thin and vascular, and near some of the lymphatic glands. They discharge a viscid, purulent fluid, and present the same ragged and unhealthy appearance, and are not disposed to heal. The lymphatics become swollen and corded and stand out in prominent relief on the body, and are inflamed and painful to the touch. In some of the cases of chronic farcy these swellings and the farcy buds or ulcers may take on a healthy action, the swellings subside and the ulcers cicatrize, still only to recur again after a longer or shorter time with greater violence, and frequently they resolve themselves into the acute form of glanders, and the animal dies.

Between these two extremes of the same disease—acute glanders and chronic farcy—may be met many intermediate forms of the disease, and this divergence of phenomena exhibited renders it exceedingly difficult to form an exact and correct classification, and makes it misleading to the most experienced and careful practitioner in dealing with it in daily practice.

The diagnosis of glanders is extremely difficult from the fact of its many varied symptoms, and especially is this the case in the chronic form where all external pathognomonic symptoms may be wanting; but the fact of any suspicious phenomena is sufficient to warrant a questionable diagnosis, and the animal so suspected should at once be isolated and held under observation sufficiently long to allow the development of whatever disease the animal may be laboring under.

In acute glanders there will be little difficulty in determining the disease, but too much care cannot be exercised in the examination of suspected cases, and especially in a stable where glanders has occurred. The prognosis of glanders is always unfavorable; treatment is never justifiable from the fact that it is incurable, and on account of the danger of extension of the disease to man and other animals.

In our railroad stables, where there is so much money involved and where glanders would have so fertile and

suitable a soil for development, the prophylactic or preventive treatment should be employed at all times. All suspected cases that have any doubts as to their condition should at once be isolated and the place where they stood disinfected; the utensils, harness, blankets, and other articles they may have come in contact with removed, and should the animal present the symptoms of glanders it should at once be destroyed and all the articles burned.

None but accredited veterinarians should be permitted to examine either glandered or suspected animals. Special persons should be detailed to care for the suspected, and no healthy horse should be permitted to use the utensils that have been in contact or have been used by the suspected animal unless they have been thoroughly cleaned and disinfected with boiling hot water containing carbolic acid in the proportion of one to twenty.

Suspected horses and stables should be subjected to periodical examinations by a competent veterinarian, and these revisions should occur at least once in eight days.

The stables, floors, walls, sides of stables and mangers should be thoroughly disinfected.

There are many disinfectants and different methods that may be used, but in large stables where economy and effectiveness is required the following system will combine both; namely, to first wash thoroughly all the woodwork and stable-fixings and utensils with *boiling hot* water, permit them to dry and repeat the washing, then saturate them with a solution of the bi-chloride of mercury, one part to fifty of water, and sprinkle the stalls and floors with chloride of lime, and white-wash the walls and stalls with lime water containing one part of carbolic acid to every thirty parts of lime water.

As regards prophylactic medicinal treatment it has been advised by some writers to use the hypo-phosphites of lime and soda, and also chlorate of potassa, to be given to every horse in the infected stable, but their efficacy has not yet been thoroughly tested.

The importance of thoroughly guarding and endeavoring to stamp out this disease may be appreciated when we reflect upon the extent of its ravages in some of the railroad stables of New York City alone.

During the year 1877, in one surface railroad stable containing over twelve hundred horses, thirty-six were destroyed in one day, and during the nine months of that year the company lost three hundred horses, which at the lowest estimate would amount to $37,500, not considering the danger of infecting other horses and the cost of cleansing and disinfecting the stables.

Another stable during the same time and containing nine hundred horses, lost ninety-three horses with the disease; and in another stable where the hospital department alone was examined by request of the Board of Health, of New York City, there were condemned at two visits of the inspecting veterinary surgeon two hundred and twenty-five horses, and yet, considering the fact that so much money was lost, we may still find to-day in our stables and on the tracks cases of glanders in its different forms.

The next disease which we will consider is not so fatal as the former, but more frequently to be met with in our railroad stables; that is, *inflammation of the lungs, pneumonia, pneumonitis*, or more properly termed *pneumonic fever*.

PNEUMONIA,

the name by which it is most commonly known, is an essentially constitutional fever, with local manifestations in the pulmonary substance or parenchyma of the lungs. It was considered to be a simple inflammation of the lung substance with the usual accompanying fever, but clinical history shows that the inflammation is self-limited, undergoes certain changes, terminates with a crisis, has a definite pyrexia, and a premonitory chill. These facts together with the fact that pneumonia cannot be produced by any experimental means, proves that it is constitutional and not local, and should be classed among the essential fevers.

It may be considered under different varities according to the lesions in the lungs. The most common forms are the *lobar* or *catarrhal*, and the *broncho-pneumonia;* the other forms that are to be met with are the *circumscribed, insterstitial* and *secondary*.

THE CIRCUMSCRIBED

is the form where the inflammatory condition is confined to a certain area, and these cases are usually mild, involving but a small portion of a lung and accompanied with a low temperature.

THE INSTERSTITIAL

form is seldom met with; here the inflammatory products are thrown out into the interstices of the lung tissue. It presents grave symptoms and in diagnosing it may be confounded with some other complication.

THE SECONDARY

pneumonia is a variety which follows some depleting condition, or occurs while the animal is convalescing from some other disease. But the form which we will consider and which we will contend with the most in our railroad stables, is the *exudative* or *lobar*, and the *broncho-pneumonia*. In order to fully understand the inflammatory action and pathological condition of pneumonia in a horse, it will be necessary to be somewhat familiar with the structure of the horse's lungs.

The physiological action of the lungs is in all animals the same—that of supplying oxygen to the blood, and removing the carbonic acid gas. But their anatomical structures differ. The lungs of a horse, as in all animals, are divided into two lobes—right and left—occupying respectively the right and left portions of the thoracic cavity. Each lobe is surrounded by an external serous envelope, know as the visceral layer of the pleura. The pleura is a serous sac composed of two layers, a parietal and a visceral layer; the parietal layer is attached to and surrounds the internal surface of the thorax, and the visceral surrounds each lobe of the lung; its office is to supply with moisture and protect the surface of the lung.

The lung proper is composed of a fundamental tissue which is of a bright rose color, soft, elastic, and very resisting. It is partitioned into a number of small lobules by septa of connective tissue, and each of the lobules receives a small bronchial tube known as a bronchiole, and each lobule is surrounded with a net-work of blood-vessels, composed of the capillary ramifications of the pulmonary artery and pulmonary veins, which carry to and take away the blood. The air which the animal

breathes, passing through the nostrils, enters the larger bronchial tube in the throat, then into the smaller tubes of each lobe of the lung, and into the small lobules, where it comes in contact with the blood; and it is at this point that the physiological act of respiration takes place; the air coming in contact with the delicate membrane which surrounds the capillary blood-vessels gives up oxygen and receives the carbonic acid gas, which is thrown off from the blood, and it is within these air-cells or lobules that the inflammatory action of pneumonia takes place.

The first appreciable change resulting from the inflammation is the same here as in other situations, namely, active congestion accompanied with a transudation of serum, this is known as the stage of *congestion* or *engorgement*, from the fact that, the capillary blood-vessels becoming greatly distended with blood, the serum transudes through the walls of the blood-vessels and fills up the small lobules or air-cells; this stage of engorgement may exist from one to three days and it may involve a portion or a whole of a lobe, usually a portion, and that the lower or anterior third of the lobe.

At the end of the second or third day the second stage, or stage of *red hepatization*, takes place, which is the point at which the air-cells and bronchioles, or smaller bronchial tubes, become filled with a solid exudation and cease to contain air. The diseased portion of the lung at this stage is of a brownish-red color, non-crepitant, and when cut presents the appearance of the liver, hence the name hepatization. If the chest is opened at this stage, soon after death, the lung will not collapse at the affected part, and the substance of the affected portion of the lung readily breaks down under pressure of the fingers and does not present the friable appearance as when healthy, and owing to the absence of air the diseased or solidified portion of the lung will sink in water. The dark red color of the lung in this stage is due to the large number of red blood corpuscles which are present in the exudation. This stage of red hepatization may continue to the fifth or seventh day, when the red color begins to give place to a greyish color, and this condition is known as the third, or stage of *grey hepatization*. This stage is the condition in which the inflammatory products are in a process of absorption, the red blood corpuscles lose their coloring matter, the pus cells contained in the exudated serum undergo fatty degeneration, the fibrine becomes granular, so that a kind of granulo-fatty emulsion is formed, which is suitable for absorption by the lymphatics and blood-vessels of the lungs, these changes giving the affected part a greyish color. After the removal of the exudation the air-cells gradually resume their functional capacity, and are found in a few weeks to have sustained no damage.

This is a history of the anatomical changes of favorable cases. But there are a number of variations and complications which may take place.

PLEURITIS,

with fibrinous exudation may be developed in that portion of the pleura covering the affected lung; in this complication the term *pleura-pneumonia* is applied.

PURULENT INFILTRATION,

may take place in the air-cells, the walls of which break down, and there is formed a purulent abcess which may undergo degeneration and become absorbed, or may rupture through the external covering of the lung, and the animal will succumb to pyæmia.

GANGRENE

of the affected portion may occur. *Bronchitis* usually exists with pneumonitis in the affected lobes, but bronchitis should never be confounded with pneumonia, nor does bronchitis, as the primary affection, tend to the development of pneumonia; and the latter has no tendency to give rise to bronchitis save within the affected lobes.

The causes of pneumonia are of a specific character, the nature of which are at present unknown. That it is a purely constitutional and not local disease is now held and believed by all of the most recent investigators; that it is essentially of a constitutional type is not only proven from the fact of its clinical history and anatomical nature, but also from the fact that it cannot be produced by any external or mechanical means.

Its nature and cause is believed to be due to some specific morbid condition of the blood, yet unknown, which nature endeavors to rid itself of by means of the local manifestations in the lung substance; still there are certain influences and conditions which are exciting and predisposing.

Horses that are convalescing from some debilitating disease, or run down and weakened from severe exertion, insufficient food, and bad hygiene are more liable and usually undergo a severe type of the disease. Sudden variations in the temperature, at any time of the year, is a predisposing cause. The removal of horses from a distant place, the excitement and nervous prostration due to the journey, the change of climate, the want of proper clothing and good feed, are inducing causes. The lack of ventilation and insufficient air space in large stables, and the close confinement of a number of horses in a stable without due care given to the removal of the emanations and gases will excite an attack of pneumonia.

Those horses which are exposed to the vicissitudes of the weather and are overworked are most liable, and yet the disease is frequently found among those animals that are carefully nurtured, well groomed, and used only for road purposes. Pneumonia also occurs as a complication of other diseases. Different affections of the kidneys have been supposed to stand in a causative relation to it.

In the middle Atlantic states, it occurs most frequently during the winter and spring months. Some years it prevails more and proves more fatal than others.

The symptoms of pneumonia are as a rule very prominent: anorexia, a dejected coutenance, frequently a cough, although sometimes wanting, temperature increased from 102° to 104° Fahr., pulse and respiration increased, and in most cases there is a well-marked chill which may continue from one to three hours. The bowels become constipated, and the bladder is not evacuated as frequently as in health. These are the general symptoms. The local signs are to be elicited from the chest itself by means of percussion and auscultation. Percussion is an act performed by pressing the middle finger of the left hand firmly upon the different parts of the chest, either upon the ribs or the intercostal spaces, and distinctly and uniformly tapping it with the tips of the closed fingers of

the right hand. By this means if the lung is healthy there will be heard a low, resonant sound over all parts of the lung; but should any portion of the lung be inflamed and contain an exudative product, percussion on that point would elicit a hard, distinct sound without resonance and appear as though one was tapping on a hard substance.

Auscultation is the method by which we listen to the sounds caused by the air passing in and out of the lungs. It is performed by pressing the ear against the different parts of the surface of the chest and listening to the sounds of the air passing in and out. If the lungs are healthy there will be a soft, rustling sound, somewhat approaching a murmur, and might be compared to the gentle rustling of green leaves in the woods. And in the first stage of pneumonia there will be heard over the affected parts a crepitant sound, which might be compared to the sound of salt sprinkled on the fire. This crepitancy will continue for two or three days and then gradually give way to no sound at all, excepting the bronchial sound of the air passing into the larger bronchial tubes, and this want of any sound will indicate the second stage or stage of red hepatization. This lack of respiratory murmur may continue from four to eight days, and then there will be noticed in the sounds a return of the crepitancy, which will indicate a third stage. Should resolution continue favorable a return to the rustling murmur of healthy lung tissue will be found. Auscultation is the best means for determining the condition of the lungs when diseased, and also the most difficult. And to become familiar with the normal and abnormal sounds, one should carefully listen to the sounds of healthy lungs, and then compare them with those that are diseased.

By percussion or tapping the surface of the chest, the diseased portion of the lung will be detected by the sound. Instead of a clear, resonant sound that will be produced over a healthy lung, there will be heard over the affected part a dull, hard sound as though one was tapping on a board, or some solid substance.

In the treatment of pneumonia we must always remember that it is a self-limited disease, has three stages which it undergoes before resolution takes place, and therefore each stage furnishes different therapeutical indications.

Should the case be seen in the first stage that of engorgement, high fever, accelerated pulse and respiration, and presenting the crepitant sound upon auscultation, an endeavor should be made to arrest or at least to lessen the force of the attack. Heretofore, blood-letting, cathartics and the so-called anti-phlogistic methods of treatment have been considered abortive; but experience has abundantly shown that these measures cannot be relied upon, and that they frequently leave the animal so debilitated as to be unable to withstand the remaining stages of the attack.

It has been found in the daily practice of the writer, and verified by the testimony of other practitioners, that if the case is seen in its first stage, a full dose of sulphate of quinia from one to two drachms, according to the size of the animal, will in some cases arrest the disease, and should it not abort the disease, it always leaves a favorable influence in the course of it, by its anti-pyretic effect. Again, in the first stage the rational system of treatment should be employed, the animal should be placed in a roomy, well-ventilated, white-washed stall, containing clean fresh straw and plenty of light; there should be no draught and the animal should be moderately clothed and all the legs to the first joint be bandaged and thus endeavor to keep an equal temperature of the whole body.

Blisters, strong stimulating liniments and thick mustard paste are injudicious, but the applications of a mild liniment composed of aqua-ammonia one part, spirits of turpentine two parts, alcohol four parts and olive oil sixteen parts, gently rubbed on the chest and a bandage of red flannel applied, or what is more convenient in our stables, the best English mustard four ounces to one quart of water, applied with moderate friction and then the flannel bandage applied, will act beneficially, and should simply be used to stimulate the chest-walls and should not cause the animal great uneasiness, for the excitement following the application of strong mustards are frequently productive of unfavorable results.

Water or better gruels composed of oat-meal and water, containing one ounce of nitrate of potassæ and one drachm of chlorate of potassæ to each pailful, should be allowed to remain in the stall for the animal to drink at its pleasure. Nutritive foods and any green foods, if they can be obtained, should be allowed; soaked hay, and mashes composed of bran, cut hay and oats are often found acceptable, but the rule should be to allow the horse whatever he will eat.

During the second and third stages the treatment best adapted to our railroad horses is of a tonic and stimulating character. As a tonic there is nothing equal to quinine, and best administered in the form of a drench composed as follows: Sulphate of quinine, ½ drachm, alcohol, ½ ounce, sulphuric acid, aromatic, ½ drachm, water, 12 ounces, given night and morning, and as a stimulant the balls composed as follows:

Ammonia Carbonate	2 ounces.
Camphor Pulverized	1 "
Nux Vomica Pulr	1 "
Genetian Root Pulr	3 "

Simple syrup, a sufficient quantity to make the mass adhere, and then divide it into six balls and wrap each in a piece of tissue paper. These balls should be given three times a day, and when the disease is approaching the point of crisis, which occurs from the ninth to the twelfth day, these stimulating balls should be given every four hours, and if the animal will drink freely, six ounces of brandy or one ounce of alcohol should be given in a pail of water.

True, there are other treatments, and for which their adherents claim great success, but in the hands of the writer and experience of others who have had the care of surface railroad stables the above treatment has shown the best results.

The prognosis of pneumonia among railroad horses is as a rule favorable; still it should be guarded and a careful survey of the animal made before giving a prognosis.

Should the animal present a healty, robust appearance and there be no indication of complications, there is then reason to expect with the above treatment a favorable result; but if the animal is advanced in age, not in strong condition, and presenting grave symptoms at first, a favorable prognosis should not be given.

(*To be concluded.*)

Brooklyn Street-Railways in 1885.

THE Brooklyn (N. Y.) City Railroad Company has prospered as usual under President Hazzard's able management, and this in the face of elevated opposition, large outlays for improvements and expenses caused by the city's sewer building. The new stable at Halsey street and Broadway, one of the best ever erected, has been in use since November 4th, and another but smaller depot is under way on Flushing avenue near Marcy. An extension of the Flushing avenue and Myrtle avenue lines has been authorized and a large amount of retracking and paving done. The company's machine-shop on Myrtle avenue was put into successful operation in January, 1885, and has become a great center of usefulness. During the summer, President Hazzard and Messrs. Husted, Thomas and How, of the executive committee, spent much time in inspecting improved methods of surface propulsion, but found none on which the majority cared to risk their funds, the president standing alone for improvement on the final vote.

The Atlantic Avenue Company reached out and gathered in two more roads in the twelve months and started a third wholly new one. It bought the South Brooklyn Central on January 31st, of last year, and leased the Prospect Park line on December 10th. The new line running from Hamilton ferry to the bridge, began operations December 14th. A new stable at the corner of State street and Boerum place went into use the same day, as did also a system of transfers which makes possible a vast amount of traveling for a single fare. On the few remaining roads and those operated through the eastern district there have been few changes, the most notable being the opening of a line from Nostrand and Park avenue to Greenpoint via Lorimer street, and the building of a line on Ralph avenue by the Broadway Company.

The Binghamton Cable Railway.

THE new system of cable railway on trial in Binghamton, N. Y., dispenses with the grip. Two cables are used, one driven in the ordinary manner by a stationary engine, the second and smaller cable taking motion from the first. This second cable is led continuously over a loose drum or pulley fixed under the car. While the drum is free to revolve the cable simply imparts motion to it and the car does not move, but by the application of a brake, stopping the motion of the drum, the car is carried forward with the cable. To stop the car the brake is lifted. The secondary cable comes up through the slot in the cable conduit on the approach of a car, and as it passes drops back again below the level of the street. The value of this invention remains to be demonstrated.

An Electric Tram-Car in Berlin.

THE official trial of an electric tram-car, constructed by Mr. Reckenzaun, took place at Berlin, Germany, on December 12th. No private trials were allowed, the first run being in the presence of the directors of the Grosse Berliner Pferderbahn-Gesellschaft, accompanied by representatives of the municipal authority and inspectors of public safety. The car ran without a hitch and to the satisfaction of all present. The line is not an easy one, there being a curve of thirty-three feet radius to start with, leading up an incline. The temperature was 11° centrigrade below zero, and the rails were partly filled with snow and ice. Mr. Reckenzaun had to start, stop, reverse and vary the speed frequently. The trial was a most successful one.

The Fare-Register Suit.

IN the suit of the Railway Register Manufacturing Company against the North Hudson County (N. J.) Railroad Company for infringement upon the patents controlled by the former company, judgment was rendered the plaintiffs some months ago by Judge Nixon, in the United States District Court, of New Jersey. Recently application was made by the defendants for a reargument of the case, which application was denied.

STREET-RAILWAY NOTES.

THE Chicago City Railway Company has 89.25 miles of track, 20 miles of which are operated by cable at an average speed of 9.5 miles per hour. About half of this length of conduit has a steam-pipe for melting the snow and ice.

THE Newtown (Mass.) Street-Company is to be incorporated with a capital stock of $50,000. Electricity or steam will be the motive-power, and the charter will authorize them to furnish electric-power to the town.

THE City Electric Railway Company has been incorporated at Chicago for the construction and operation of electric elevated, surface, underground, or suspended railways. Capital stock, $3,000,000.

THE West Division Railway, of Chicago, will build a 400-stall stable and a car-barn at the corner of Van Buren street and Kedzie avenue, this coming spring. The buildings will cost $100,000.

THE Duluth (Minn.) Street-Railway Company's entire plant has been sold for $75,000. It has been bought by a new company, which intends to increase the facilities of the road.

THE Appleton (Wis.) Electric Street-Railway Company has been incorporated with a capital stock of $35,000. It is expected that the road will be ready for operation by July.

THE New York District Railway has been incorporated to build an underground line under Broadway from the Battery to Harlem river, via Eighth avenue.

A SCHEME is on foot in Brockton, Mass., looking to the formation of a stock company for the manufacture of street-railway cars in that city.

THE Capital City Street-Railroad Company, of Montgomery, Ala., intends adopting the Van De Poel electric system on their line.

AT the annual meeting of the street-railway companies of Philadelphia, the old officers were reëlected in every case.

THE Rapid City (Dak.) Street-Railway Company has been incorporated in the territory. Capital stock, $100,000.

THE Guanajuato (Mexico) Tramway was opened for traffic on February 5th, the national holiday.

THE elevated road running from the ferry at Hoboken up the Heights now in operation.

New Inventions.

Giles' Car-Coupling,

HARVEY A. GILES, of Dows, Ia., is the inventor of an improved form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a perspective view of the front end of a car provided with the car-coupling, and Fig. 2 a top view of two couplings coupled together.

A indicates the draw-head, which is formed with a laterally-projecting horn or hook B, and with a recess C, in its outer end, having a vertical perforation D, passing through it, the recess and perforation being for the reception of the usual link-and-pin, where the coupling is used in connection with a car having the common link-and-pin coupling. The draw-head has a vertical perforation E, at the inner end of the same and at the edge opposite to the edge having the hook, and a pin F, passes through the perforation, and has the inner perforated ends G and H, of a long loop or bail I, pivoted upon it above and

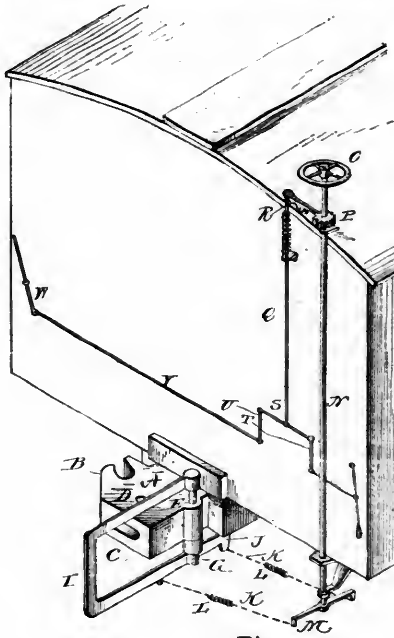


Fig. 1.

GILES' CAR-COUPLING.

below the draw-head, swinging in a horizontal plane. The inner end of the lower arm of the bail or link is extended to form an arm J, and a chain K, is attached to the end of this arm, and a similar chain K, is attached to the lower arm of the link at the same time distance forward of the perforation and the pin as the other chain is back of the perforation and pin. These chains are provided with spiral springs L, at the middle, and are secured at their outer ends to the ends of a bar or lever M, attached at its middle to a vertical shaft N, journaled in bearings upon the front of the car. The upper end of this shaft is provided with a hand-wheel O, for operating it, and near the upper end of the shaft is secured a cogged wheel P, which is engaged by the upper end of a vertically-sliding spring-bolt Q, having a treadle or foot-piece R, at its upper end to the side of the portion engaging the cogged wheel. The lower portion of this spring-bolt is connected by means of links S, to two bell-crank levers T and U, one, T, of which has its other arm projecting out to the side of the car, while the other bell-crank U, has a rod V, attached to its other arm, to the outer end of which rod a lever W, is pivotally attached, this lever and the bell-crank levers being pivoted upon the front end of the car. It will now be seen that when two couplings are brought together the links may first be thrown to the sides by turning the hand-wheel, if not already in that position, and after the ends of the draw-heads have come together the links may be tilted, so as to engage the hooks of the opposite draw-heads, thus coupling the draw-heads.

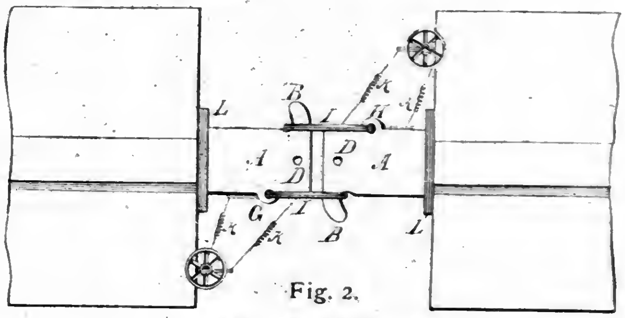


Fig. 2.

GILES' CAR-COUPLING.

The springs in the chains connecting the links with the tilting levers upon the vertical shafts will serve to allow the links to yield slightly to both sides, as the cars will sway from one side to the other during travel, the springs keeping the links in engagement with the hooks and preventing them from being forced out by any motion of the cars.

The spring-bolt will hold the cogged wheel and through it the vertical shaft in position as adjusted, and the links can neither be coupled nor uncoupled without disengaging the spring-bolt from the cog-wheel, the spring-bolt being either depressed by the treadle from the top of the car or by drawing either the outer bell-crank lever or the lever at the other side of the car outward, the bell-crank lever and hand-lever being applied to the front of the car for the purpose of releasing the operating-shaft from the ground, the person standing at the side of the car. After the spring-bolt has been disengaged from the cog-wheel the link may be operated from the ground by tilting the lever upon the lower end of the vertical operating-shaft. The spring-bolt may be of any other suitable construction—as, for instance, it may be a lever pivoted upon the top of the car and having one end engaging the cogs of the wheel, while the other end has a spring bearing upward against it, and a rod may pass down the front end of the car and be pivoted to a crank upon a horizontally-journaled shaft upon the front of the car, this shaft having suitable handles or levers at its ends for tilting it. The link is somewhat wider than the thickness of the draw-head, so that it may be moved up and down upon the bolt, and a washer X, may be placed upon the pin or bolt either above or below the draw-head for the purpose of supporting the link to enable it to engage hooks upon either high or low cars, as the occasion may require.

The inventor claims this form of coupling to be simple and inexpensive, and readily applicable to any form of railway-car, while cars employing it can be coupled to cars using the link-and-pin coupling.

McTyeire's Piston-Packing.

WILLIAM C. MCTYEIRE, of Hatchechubbee, Ala., is the inventor of an improved form of piston-packing, which is herewith illustrated and described. The invention has for its object to provide means whereby a piston-packing shall adapt itself to the wear of the cylinder, so as always to form a steam-tight joint, and means for stopping the passage of steam between the joints of the packing.

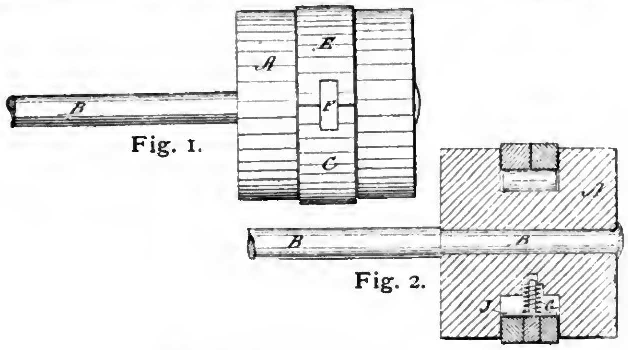


Fig. 1. Fig. 2.

MC TYEIRE'S PISTON-PACKING.

In the accompanying cuts, Fig. 1 is a side elevation of the invention; Fig. 2 a longitudinal vertical section of the same; Figs. 3 and 4 are detail views of modifications of the joint, and Figs. 5 and 6 shows modifications of the spring.

A represents the head of the piston, consisting of a solid piece of metal grooved around its center to receive the packing, and bored through its center longitudinally to receive the piston-rod. The piston-rod B, is provided with a shoulder at one end of the piston-head, and it is headed over the piston-head at the other end by riveting with a hammer, so that the head and rod become one and inseparable. The packing is made in segments C D E, first, because a whole ring could not be put into the groove piston-head; and, secondly, in order that the packing may expand and contract from the effects of heat and cold to maintain a tight joint at all times. The joints between the different segments are stopped, to prevent

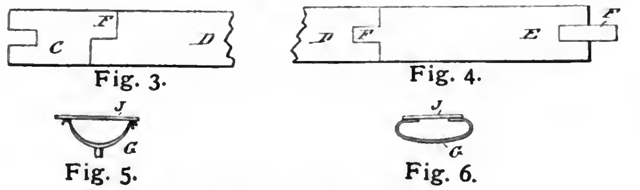


Fig. 3. Fig. 4. Fig. 5. Fig. 6.

MC TYEIRE'S PISTON-PACKING.

the passage of steam through them, by a cross-bar F, which may be made in different ways. That which is preferred is shown in Fig. 1, in which a perfect ring is first made, and then sawed into the desired number of segments by plane radial cuts. These segments are then slotted in their ends in a plane at right angles to the axis of the cylinder, and the bars F, fitted to these slots to cut off any passage for steam between the ends of the segments.

In the modifications shown in Figs. 3 and 4, a splice or lap joint is made by extending a portion of each segment across the joint to form the bar F, fitting them neatly to each other, and afterward turning the made-up ring to the internal diameter of the cylinder and to fit the groove in the piston. Beneath the segments springs G, are placed, to press them radially toward the cylinder, to keep them in contact therewith and preserve a steam-tight joint at all times. These springs may be of any suitable form, as shown in the different modifications. Fig. 2 represents a spiral-spring; Fig. 5 a semi-elliptic spring, and Fig. 6 a nearly elliptic spring joined at the ends by a presser-plate J. The object of this presser-plate is to enable the spring of whichever pattern may be used to bear equally beneath the ends of two adjacent segments, so as to keep both forced alike against the cylinder, and at the same time to lie as a steam-check directly beneath the joint, to prevent the steam from passing around beneath the edge of the splice.

The inventor claims that this device furnishes a simple, durable and efficient packing. It will effectually prevent the passage of steam between the piston and cylinder, and as it gradually wears the packing will adapt itself to the increased diameter. It is especially adapted for use where high speed is desired, and there is no liability of any part of it becoming loose or deranged.

Bare's Nut-Lock.

JOHN BARE, of Mount Union, Pa., is the inventor of an improved nut-lock, which is herewith illustrated and described. The device is particularly designed for holding the nuts of the bolts that secure the fish-plates or angle-bars of railway rails, but it is also applicable to other uses. It consists in a T-shaped spring-bar, the cross portion of which is designed to bear beneath two nuts of the fish-plate, and the stem portion of which has a bend or

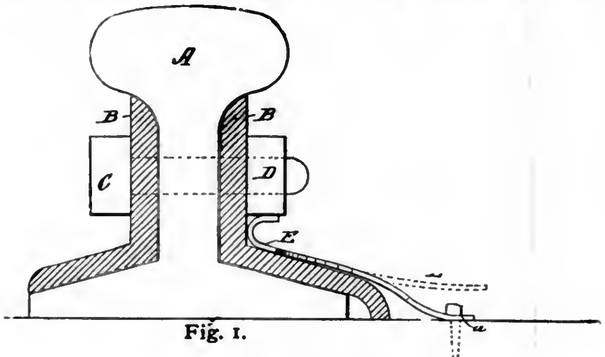


Fig. 1.

BARE'S NUT-LOCK.

set and a perforation, which bend allows the stem, when forced down and spiked to the cross-tie, to exert an elastic tension against the lower sides of the nuts that firmly holds them from turning on the screw-threaded ends of their bolts, notwithstanding the vibration and jar caused by the passing trains.

In the accompanying cuts, Fig. 1 is a cross-section through the angle-plates through the line x x of Fig. 2, showing the application of the device; Fig. 2 a side view of the same, and Fig. 3 a modification of the spring lock-bar.

A represents the rail, B B are the angle-bars or fish-plates, C the bolt, and D the nut which fastens the bolt in its position through the rail and fish-plates. E E' is the improved locking device, which is in the nature of a T-shaped spring-bar made of metal, and whose head or cross-piece E, extends a distance far enough to rest beneath the two nuts at each end of the fish-plate and be-

tween the lower faces of the pair of nuts and the fish-plate. The stem E', of the spring locking-bar is formed with a slight upward bend, as shown in dotted lines in Fig. 1, and has a hole in its end, through which a spike *a*, passes into the cross-tie. When this spring-stem E', is bent down and spiked to the cross-tie, it will be seen that an upward tension is put upon the head E, of the locking-bar that causes it to bind against and press upwardly on the nuts, holding them firmly in position and preventing

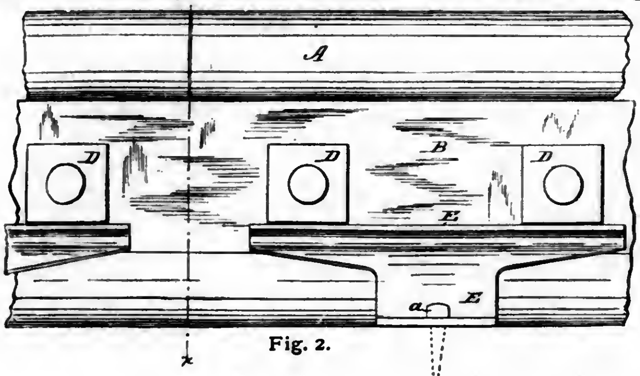


Fig. 2.

Fig. 3.

BARE'S NUT-LOCK.

them from turning. The cross-piece or top E, of the T-shaped bar is preferably bent over or folded on itself, as shown in Fig. 1, so as to fill better the space between the nuts and the fish-plate; and which fold, for greater stiffness, may be extended down to contact with the bar, as shown in Fig. 3.

The inventor claims that his device provides a simple, efficient and reliable nut-lock which can be manufactured at small expense. The device is now controlled by R. Bruce Bare, of Washington, D. C., to whom the patent-rights have been assigned.

Kirby's Canopy for Railway-Car Lamps.

JOHN KIRBY, JR., of Dayton, O., is the inventor of a new form of canopy for railway-car lamps, which is herewith illustrated and described. It consists in devices whereby the canopy may be attached in its normal position to the curved or inclined roofs of railway-cars or other structures in such way as to be capable of adjustment with reference to the position of the flame or light against which it is desired to protect the roof. Heretofore it has been customary to make these canopies especially to suit the curve or pitch of the deck of a car or other structure, because if not so made they will not hang with their lower edge at right angles with the lamp-chimney; yet it is desirable that it should so hang. The present invention enables the canopy to be so hung that it may be in normal position whatever the pitch of the roof may be, and the canopy may be used in any car, and has the further advantages over the canopy made especially for a particular structure that it may be made in quantity and held in stock—a very important advantage to the manufacturer and consumer.

In the accompanying cuts, Fig. 1 shows the canopy attached to a railway-car, and Fig. 2 is a central vertical section of the same.

A represents the outside curved roof of a railway-car, B the inside curved roof of the car, and C a tube passing through the roof to carry off the product of combustion of the lamp. The canopy is constructed as follows: D is a hollow ball, preferably spun of sheet metal, and having on opposite sides the openings *g* and *g'*. The opening *g'*, is provided with a screw-thread, as shown. G is the canopy proper, and has an opening screw-threaded and adapted to screw into the screw-threads of the opening *g'*, of the ball D. F is a tin or other sheet-metal collar having an opening in the center of less diameter than the

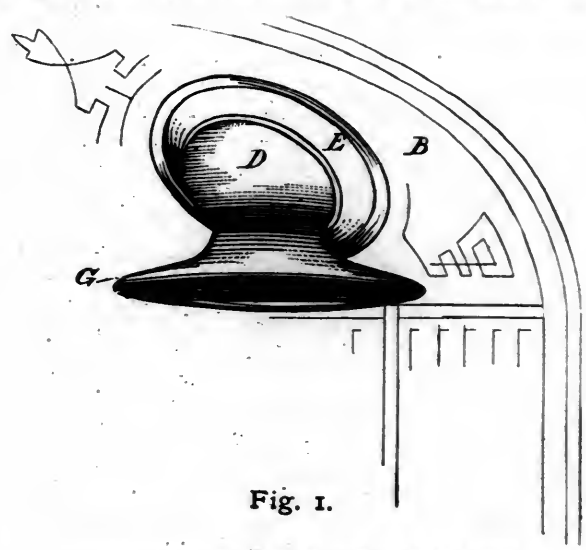


Fig. 1.

KIRBY'S CANOPY FOR RAILWAY-CAR LAMPS.

diameter of the ball D. E is a collar, preferably made of sheet metal spun or otherwise formed into the desired shape, having also an opening in its center of less diameter than the diameter of the ball D. The collars F and E, form a socket, and are held by screws or in any convenient way firmly to the inside roof of the car.

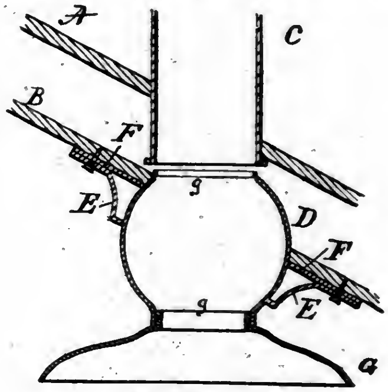


Fig 2.

KIRBY'S CANOPY FOR RAILWAY-CAR LAMPS.

The canopy is attached to the car-roof as follows: The collar E, is brought up on the ball D, from below as far as its diameter will allow. The canopy proper G, is then screwed onto the ball, and the collar F, is brought down on the ball D, as far as its diameter will allow. The flanges of the collars F and E, are then brought together and firmly affixed to the roof.

It is evident that since the diameter of the openings in the collars is less than the diameter of the ball they cannot come together, and that they form a socket to hold the ball D, free to move between them. The ball D,

with the canopy G, may thus be placed at any angle to the roof, and held firmly in the desired position at right angles to the chimney of the lamps. The ball D, as described, becomes part of the flue for the escape of the results of combustion. Where, however, the lamp is at such a distance from the canopy as not to require an outlet for the results of combustion, the ball may be made without the opening *g*. In this case the lower opening may also be dispensed with, provided the ball D, is furnished with a screw-threaded collar or other means of attachment to the canopy.

The inventor claims that this form of car-lamp canopy is simple, easy of adjustment, and can be manufactured at small expense. It is now manufactured by the Dayton Manufacturing Company, of Dayton, O., of whom further particulars may be obtained.

Cornell's Electric Time-Signal for Railways.

GEORGE CORNELL, of Crystal Run, N. Y., is the inventor of an improved electric time-signal for railways, which is herewith illustrated and described. The signal is especially designed for use in railway-stations and at dangerous points to indicate the time elapsed between trains passing the station.

In the accompanying cuts, Fig. 1 is a broken front elevation of the signal, and Fig. 2 a detailed sectional elevation of the same on the line *x x* of Fig. 1.

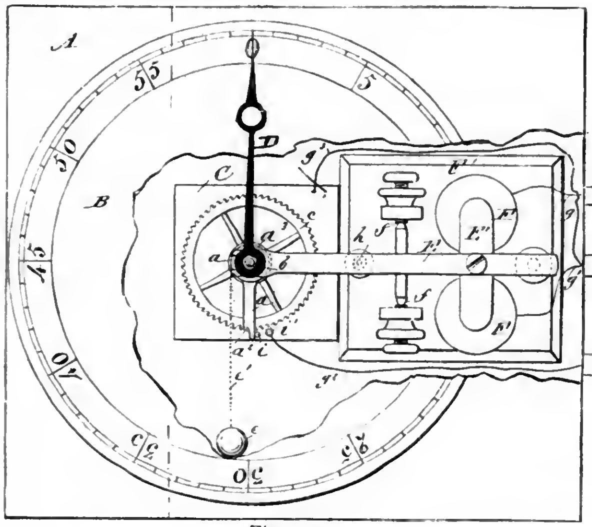


Fig. 1.
CORNELL'S ELECTRIC TIME-SIGNAL EOR RAILWAYS.

A represents an inclosure, to the front which is formed or secured a stationary indicator B, having minute-graduations marked in a circle thereon, similar to the dial of a clock. Within the inclosure A, is secured another inclosure C, or suitable frame-work, containing ordinary clock mechanism that serves to turn the hand or pointer D, in front of the dial or stationary indicator B. The pointer D, is provided with the sleeve *a*, which fits loosely upon the hand-arbor *b*, of the clock mechanism, and the arbor *b*, is made of considerable length in front of the cog-wheel *c*, secured upon the arbor, to permit the pointer D, and sleeve *a*, to slide outwardly upon the arbor. The sleeve *a*, is formed with an annular groove *d*, to receive the forward end of the lever E. It is also provided with the arm *a′*, which is provided with a pin or stud a^2, for connection with the cogs of the wheel *c*, for causing the sleeve *a*, and pointer D, to be revolved by the clock mechanism. The sleeve *a*, is also provided with the small pulley a^3, to which the weight *e*, is attached by a cord *e′*, so that when the sleeve *a*, and pointer D, are revolved by the clock mechanism the weight *e*, will be elevated to return the sleeve and pointer to the "naught-point," when the sleeve is disconnected from the clock mechanism. The lever E, is pivoted between the points *f f*, and is provided with the armature-plate E′, held in front of the poles of the electro-magnets F, which are held in the

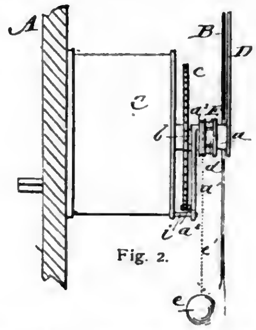


Fig. 2.
CORNELL'S ELECTRIC TIME-SIGNAL FOR RAILWAYS.

inclosure A, on the base F′, and are connected by wires *g g′*, to a battery and to a device to be operated by trains of cars passing the signal, for opening and closing the electric circuit through the magnets F. When the circuit is open, the forward end of the lever E, is drawn toward the clock mechanism C, by a spring *h*, which movement of the lever causes the sleeve *a*, to be set back by the lever toward the cog-wheel *c*, so that the pin a^2, of the arm *a′*, on the sleeve will engage with one or the other of the teeth of the cog-wheel *c*, thus connecting the hand D, with the cog-wheel, so that the hand will be moved around in front of the dial B, by the clock mechanism like the minute-hand of a clock.

The revolution of the sleeve *a*, will wind up the cord *e′*, and elevate the weight *e*. A passing train, as above mentioned, will close the circuit to the magnets F, which will operate the lever E, and cause it to force the sleeve *a*, the hand D, and the arm *a′*, outward away from the clock mechanism C, which movement will disengage the stud a^2, from the teeth of the cog-wheel *c*, and permit the weight *e*, suddenly to reverse or return the hand D, which will be returned to the naught-point and there stopped by a pin *i*, against which the arm *a′*, strikes, as shown in Fig. 1. The arm *a′*, is made exactly opposite to the hand D, to act as a counterbalance-weight to the hand, so that a light weight *e*, may be used to return the hand. The distance the hand D, travels from the naught-point around the dial toward the 55-point before being released indicates the time elapsed since the last interruption of the forward movement of the hand, so that an engineer of a train of cars approaching the signal may know how long a time has elapsed since the preceding train passed. The hand D, is stopped at the 55-point by the stop-pin *i′*, so that confusion will not arise by the hand D, making more than a complete revolution over the dial.

The stop-pin *i′*, is insulated from the clock-frame, and is connected by a wire g^2, with one pole of the battery. The clock-frame is connected with the other pole by the wire g^3, so that the contact of the arm *a′*, with the stop

i', closes the electric circuit to the magnets F, which operates the lever E, and detaches the hand from the gear *c*. The weight *e*, instantly resets the hand D, and as the circuit is so quickly broken the hand will go back but one cog. This will continue without stopping the clock until a train passes, when the hand will be set back to naught. Instead of an open a closed circuit may be used for operating the lever E, with like results. No special manner of attaching the mechanism to the track is provided, as there are several circuit-closing devices in use which are open to all.

It is claimed by the inventor that ordinarily a road could equip all of its dangerous curves with this device for so small a sum, that if one accident should be averted thereby the saving to the road would pay for the entire equipment of the device. The cost of operating the device is very slight, requiring but one Leclanchi cell of battery per signal, the signals to be wound up daily by the track-walkers. Besides the stationary cog-wheel and the clock movement to which it is attached and the stationary magnets and their armature, the mechanism is reduced to to one piece of metal, as all the rest of the parts are attached permanently and belong to the sleeve. The friction and liability to derangement is thus reduced to a minimum. The clock mechanism bearings need not necessarily be made very tight as correct time is not re-required, one or two minutes variation per hour amouting to but little in fifteen minutes, and thus the clock can be made less liable to be affected by changes of temperature.

Carpenter's Furnace for Steam-Boilers.

PROFESSOR ROLLA C. CARPENTER, of Lansing, Mich., is the inventor of an improved furnace for steam-boilers, which is herewith illustrated and described. The objects of the device are to furnish a supply of air to the unconsumed carbon rising in the form of smoke, soot, and gas from the mass of coal, to deflect the mingled carbons and

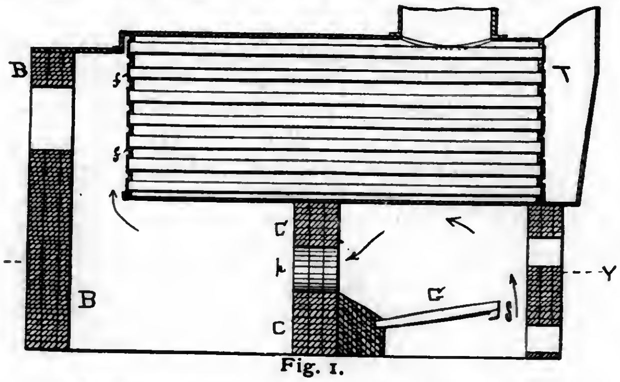


Fig. 1.

CARPENTER'S FURNACE FOR STEAM-BOILERS.

air from contact with the boiler—which is always at a much lower temperature than that necessary to produce combustion—until the combustion of the carbons shall have been perfected, and to produce a perfect combustion of the gases, smoke, and soot.

In the accompanying cuts, Fig. 1 is a perpendicular sectional view of the improved furnace, and Fig. 2 a horizontal sectional view.

A represents the boiler, and B the outer walls of the furnace. C is a bridge-wall, which is built of refractory material, and is built up close to the boiler, leaving only sufficient space for the expansion of material. Through this bridge-wall are one or more perforations having their combined area equal to or less than the area of the tubes in the boiler above. The bridge-wall is preferably built quite thick, so as to present a large surface at the apertures. The perforations do not extend to the top of the bridge-wall, but a portion of the solid wall is built above them for the purpose of deflecting the moving air and combustible matter from too near an approach to the body of the boiler. Between the bridge-wall and the front of the furnace-wall is placed a grate G, having an ash-pit below it, as is usual, but so mounted that there is between the front wall of the furnace and the forward end of the grate an open space, shown at S S, having its

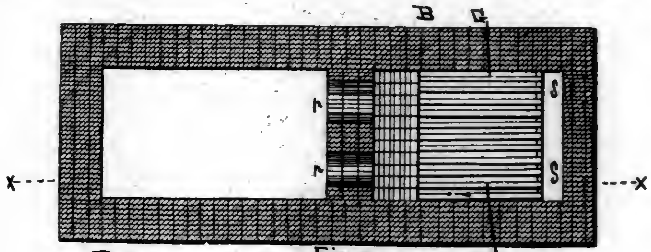


Fig. 2.

CARPENTER'S FURNACE FOR STEAM-BOILERS.

area about equal to one-half that of the perforations in the bridge-wall. The requisites of this opening are, that it shall not be clogged by throwing coal or combustibles over it, and that it be constantly kept free for the passage of air; but the opening in whatever form should have an area less than or about equal to one-half the area of the perforations in the bridge-wall, and so constructed that they shall be kept constantly open and free from choking combustibles. A current of air entering through the ordinary damper-openings in the front of the furnace passes in part through the burning coal upon the grate and in part through the aperture S S, in front of the grate, and the latter portion, while passing over the coal toward and through the openings in the bridge-wall and there mingling with the unconsumed combustible material rising from the coal, furnishes a fresh supply of oxygen, and promotes complete combustion as the mixed air and combustible material pass through the perforations. The location of the perforations in the wall at a distance below the boiler causes the combustible material to be drawn away from the comparatively cool boiler, and prevents the cooling of the gases and their consequent failure to burn. The hot gases, with their combustible material completely burned out, pass on their way to the chimney through the flues *f f*, and there part with their heat to the water surrounding the flues.

The aperture S S, can be utilized by the fireman for the ready removal of clinkers, and its presence compels the proper admission of air over the top of the burning coal, in spite of the most careless attention of the fireman. The grate G, may be set either horizontal or raking. It is preferable to set it with the rear end lower, as such a setting causes the coal to work constantly backward and away from the aperture S S.

Furnaces constructed as above described have been in use for some months in the Michigan State Agricultural College and also in the State School for the Blind at Lansing, and have given entire satisfaction. A considerable economy of fuel has been effected by their use.

Lane & Thorp's Car-Starter.

John A. Lane and James M. Thorp, of Detroit, Mich., are the inventors of an improved car-starter for use on street-railway cars, which is herewith illustrated and described. It consists in a device by which the power of the horse is temporarily applied to give a rotary impulse directly to the wheel, so as to revolve the wheel partly and then transfer the power to the usual conditions for draft purposes.

In the accompanying cuts, Fig. 1 represents a side view of the device; Fig. 2 a top view, and Fig. 3 an enlarged sectional view of the draw-bar H, two anti-friction rollers *d e*, and the hook *f*.

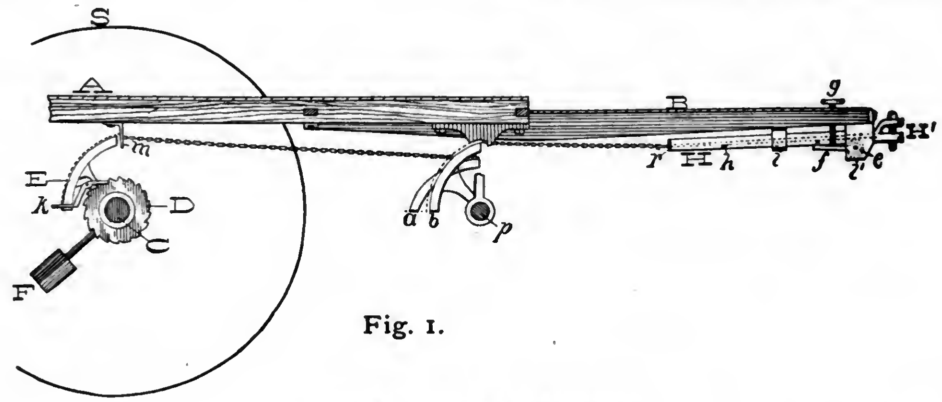


Fig. 1.

LANE & THORP'S CAR-STARTER.

A represents the car-bottom extending back over the wheels, one of which is represented by S, and B is the car-platform. Under the platform by suitable hangers is attached the draw-bar H H', adapted to move backward or forward until such motion is stopped by the stop *r*, or the draw-bar H', striking against the hanger *i*, or the hanger *i'*. Between the rear end of the draw-bar, when completely back, as shown, and the axle of the wheel, is hung a block or counter-shaft having two sectors of

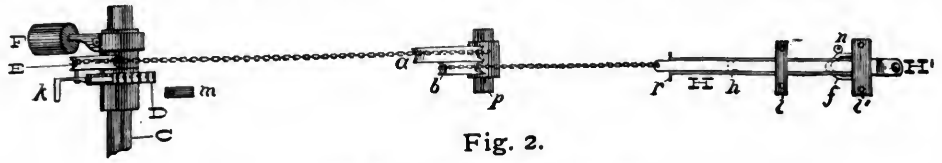


Fig. 2.

LANE & THORP'S CAR-STARTER.

circles *a b*, turning upon a common axis *p*, the periphery of these sectors being spiral to the axis on which it turns. This forms a differential sector-pulley by the use of which the draft is transferred gradually and without a shock from its action in giving a rotary motion to the wheel to its ordinary conditions for draft purposes. Upon the axle C, of the wheel is fixed the ratchet-wheel D, and mounted loosely beside it is a sleeve carrying another sector-pulley E, which carries a pawl adapted to engage in the teeth of the ratchet-wheel D. This sector has its periphery spiral to the axle also, and thus it reduces the leverage as the car gains motion. On the sleeve is fixed an arm holding a weight F, by means of which the mechanism is set in position for starting, as shown in the cuts.

From the rear of the draw-bar H, a chain passes to the differential sector-pulley *b*, passing around to the rear or lower part. Another chain attached to the upper and forward part of the sector A, passes to and around to the rear of the sector E, upon the axle of the wheel. The forward motion of the draw-bar acting through the chains and over the variable differential sectors *a b*, through the sector E, pawl K, and ratchet-wheel D, rotates the wheel S, upon its axis until, in the course of its revolution, the pawl K, is brought against the lug M, attached to the car-bottom, thus throwing it out of gear; and at the same time the beveled stop *h*, slips over the hook *f*, thus holding the draw-bar from pulling back, and the usual draft conditions are established. By pressing on the foot-piece *g*, which springs down the hook *f*, and releases the draw-bar, these motions will be reversed by the weight F, and the mechanism set to start the car again. By the use of the differential sector-pulleys *a* and *b*, two results are accomplished: First, the leverage is increased and consequently the power applied to rotate the wheel S, to any desired extent; and second, as the power begins to be effective the difference in the gearing becomes less, thus bringing the draft gradually and not suddenly into the usual conditions for moving the car upon the track.

Fig. 3 shows the hook *f*, dropped and also turned down. It is to be pivoted on the axle of the roller *e*, and to be held up by the two springs *x x'*. *n* is a plate on the side of the hook *f*, to receive the shank of the foot-piece *g*. There may be a shield of sheet iron placed under and in front of the hanger *i'*, to keep the mud out of the

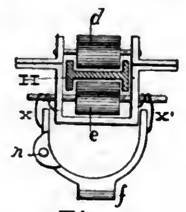


Fig. 3.

LANE & THORP'S CAR-STARTER.

rollers and hook. The foot-piece may be taken out when the car is going the other way, so as to prevent any one on that end of the car from setting the starter. The draw-bar should always be out when not ready to use.

This car-starter is claimed by the inventors to be simple in construction, strong, durable, and readily attached to any car. It is further claimed to be as nearly automatic as possible. A test with a model has shown a power of three to one, tending to demonstrate that by the use of the device one horse may start a loaded car as readily as three horses without the aid of such device. If more power is needed the diameter of the forward sector-pulleys can be increased to twice that shown in the cuts.

Vogel's Electric-Alarm for Locomotives.

WILLIAM VOGEL, of Chicago, Ill., is the inventor of an electric-alarm for locomotives, which is herewith illustrated and described. The invention provides an improvement in electric alarms or signals for locomotives on approaching switches, stations, bridges, etc.; and it consists in the combination of a number of electrical contacts, corresponding to the number of tracks with which the switch connects, and which are electrically connected to a corresponding number of contacts which are placed at the switch, a switch-rod which is connected with the ground-battery, and which is provided with a device for resting upon one of the contacts, a ground-battery which is connected to the rails of the main tracks, and a suitable operating mechanism placed upon the locomotive for the purpose of sounding an alarm and exposing a sign or signal to the engineers, showing whether it is safe to proceed or not. The object of this invention is to attract the attention of the engineer in passing a certain point which is distant from the switch, and, by exposing a signal or sign, notify him whether the switch is making connection with the right track or not.

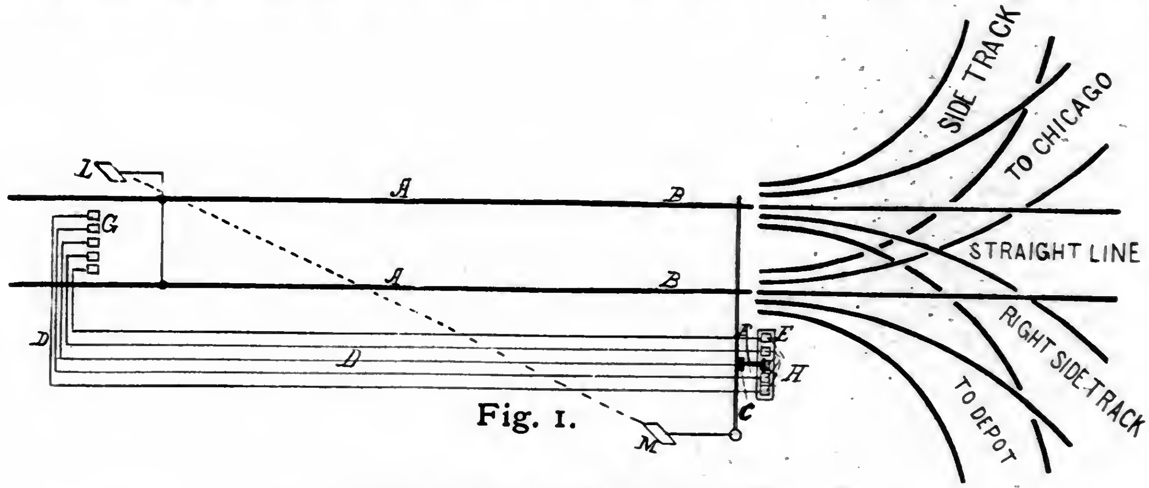


Fig. 1.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

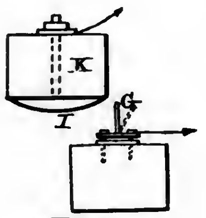


Fig. 2.

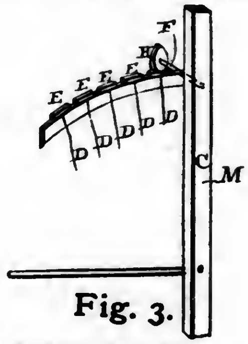


Fig. 3.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

In the accompanying cuts, Fig. 1 is a plan view of the track and the connections; Fig. 2 a detail view showing the connections between the contacts on the locomotive and those on the track; Fig. 3 shows the connection between the switch and the contact point; Fig. 4 shows the electrical apparatus on the locomotive; Fig. 5 shows the connection between the electro-magnets and the drops; Fig. 6 shows the signs used on the locomotive to notify the engineers; Figs. 7 and 8 are detail views of the electro-magnets, and Figs. 9 and 10 different views of a modification.

A represents the main track, B the switch, and C the switch-arm for moving the switch so as to connect the main track A, with any one of the tracks on beyond the switch. At any suitable distance from this switch, in between the rails of the main track, will be a suitable number of contact-points G, (shown especially in Fig. 2) and which will project any suitable distance up above the tops of the main rails of the tracks. Of these contacts G, there is a number corresponding to the number of tracks with which the switch B, connects. Each contact G, is insulated from the cross-tie upon which it is placed by a suitable bed or cushion of rubber, or any other suitable substance. This rubber serves both to insulate the contacts

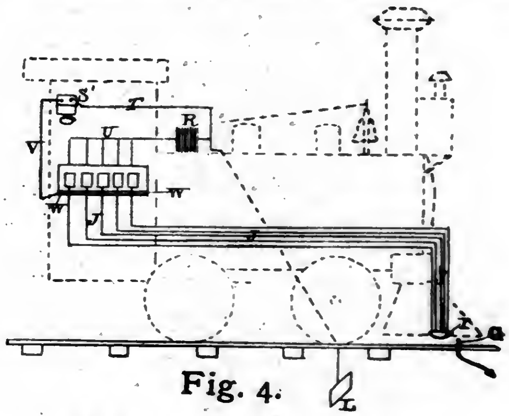


Fig. 4.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

G, and to allow them to be bent slightly forward when struck by the locomotive, as shown in dotted lines, so as to allow the locomotive to pass freely over them. Each one of these contacts G, is connected by means of a wire D, which runs along upon the poles placed by the side of the track to the corresponding insulated contacts E,

placed just beside the switch-rod. Connected to the switch-rod C, is a ground-battery M, and connected to the rails of the main track near the contact-points G, is a second ground-battery L. Secured to the switch-rod of the lever is a short arm F, to the outer end of which is

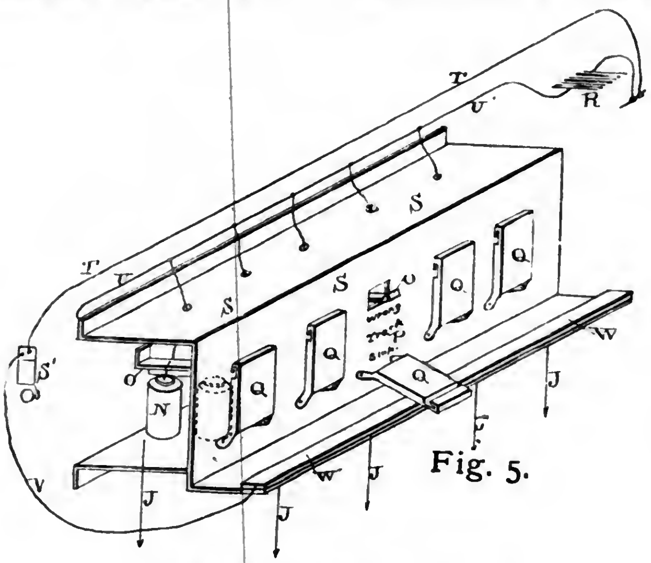


Fig. 5.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

connected a wheel or other similar device H. When the switch-rod is moved so as to make the switch B, connect with any one of the tracks which connect with the main track, this wheel H, is made to move along over the tops of the contacts E, which are suitably arranged for the

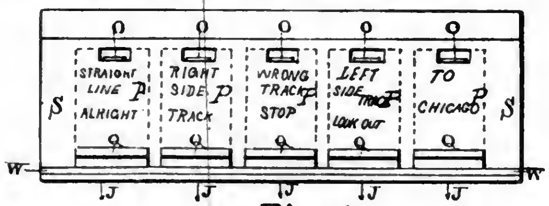


Fig. 6.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

purpose, and whenever the switch B, is made to connect with one of the tracks, this wheel H, rests upon the top of the corresponding contact, so as to make electrical connection with the corresponding contact G, by means of the wire D. By this construction it is impossible to move the switch-lever without forming an electrical connection between the corresponding contacts E and G, for the purpose of communicating with the engineer when the locomotive passes over the contacts G.

To the under side of the pilot of the locomotive will be secured the cross-bar K, to the under side of which are secured a number of curved contacts I, which are arranged in such relation that when the locomotive passes over the contacts G, every one of the contacts I, will make connection with the corresponding contacts G, and as the contacts I, pass over the contacts G, the contacts G, will be forced forward, as shown in Fig. 2. Each contact I, on the locomotive, of which there will be a number

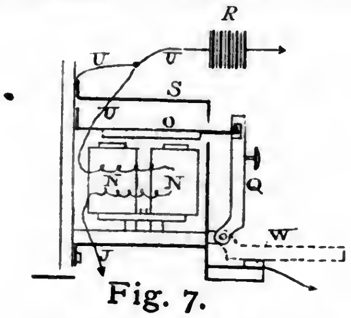


Fig. 7.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

corresponding to the number of the contacts G, is connected by means of a wire J, with the pairs of electro-magnets N. There is a pair of these electro-magnets N, for each of the contact-points G, and for each of the electro-magnets there is an armature O, and a corresponding sign or signal P, and drop Q.

Upon the locomotive, at any suitable point, is placed a

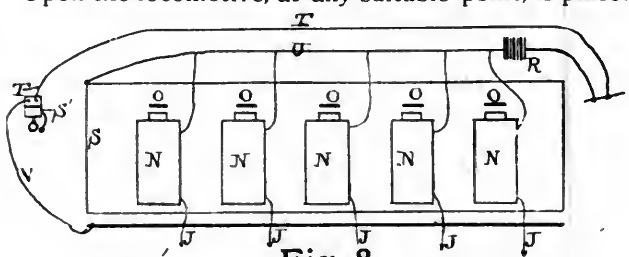


Fig. 8.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

battery R, which connects with the pairs of electro-magnets N, and with the frame S, at one pole, and with the boiler or any other suitable part of the locomotive at the other pole, and to the alarm-bell S′. The current which is connected with the locomotive is intended to pass down through the wheels to the main track, and thus form connection with the currents which pass from the ground-batteries L M. From one pole of the battery passes the wire T, which connects with the alarm-bell S′, and the wire U, from the other pole, for connecting with the electro-magnets and the insulated frame S. From the alarm-bell extends the wire V, for the purpose of con-

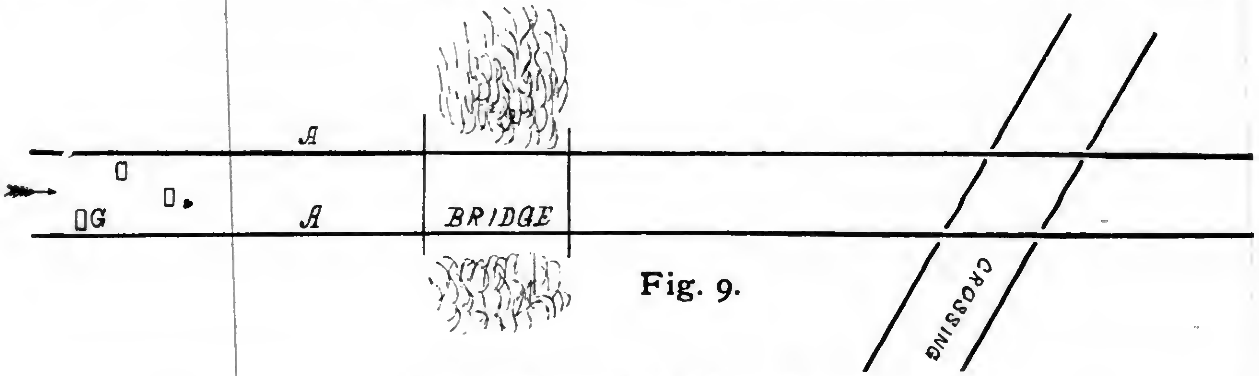


Fig. 9.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

necting with the insulated support W, upon which the drops Q, fall.

When a current is passed through any one pair of the electro-magnets N, in passing over the contacts G, the the armature O, is drawn downward, which releases a drop Q, from the hook end of the armature, and the drop falls upon the support W, which is suitably insulated from the frame S, and connected by the wire V, to the alarm-bell S', When the drop Q, falls, a sign or signal of any suitable kind—such as is shown in Fig. 6—is exposed at the same time that the alarm-bell S', is sounded by the passage of a current through the frame-support W, wires V, T, and alarm-bell. A glance at the sign or signal exposed shows the engineer whether it is safe to proceed or not. For instance, the locomotive is moving in the direction of the switch, and the contact-points I, on the locomotive strike against the contact-points G. As above described, moving the switch rod into any desired position makes electrical connection between one of the contacts G, and one of contact-points E, by stopping the wheel H, upon one of the contacts E. If the connection

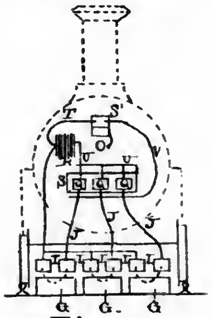


Fig. 10.

VOGEL'S ELECTRIC-ALARM FOR LOCOMOTIVES.

is not to be made with that portion of the main track which is beyond the switch, and the switch is moved so as to connect with this portion, this wheel H, will rest upon the central contact E. Then the corresponding contacts G I, are in condition to have a current passed through them, through the wire J, through the corresponding pair of electro-magnets N, and the battery. The armature O, being drawn downward by the closing of the circuit, the drop Q, falls and the alarm-bell instantly sounds for the purpose of attracting the engineer's attention to the sign "wrong track," which is exposed by the falling of the drop Q. When the contacts I G, make connection, a circuit is passed through one of the wires T, electro-magnets N, wire V, battery R, through the boiler, through the wheels, the rails of the main track, down to the ground L, through the ground to M, through the switch-rod C, wheel H, contacts E, wire D, and contact G.

When it is simply desired to show the engineer where he is on the track at night or in foggy weather, the contacts G, on the track will be made wider, and then there will be two contacts I, on the locomotive for each one G, and no wires D, or switch. When contact is made between the one G, on the track and the two contacts I, on the locomotive, a current is passed from the battery down through the three contacts back through the wires J, and electro-magnet, to the other pole of the battery. These contacts may be arranged along the track at any desired point, and used to indicate bridges, curves, crossings and stations, and each contact will have its corresponding sign, so as to let the engineer see just where he is or what he is coming to.

This device is now entirely controlled by Adolph Zeller, of Chicago, to whom the patent-rights have been assigned.

Ursbruck's Nut-Lock.

JOSEPH B. URSBRUCK, of Philadelphia, Pa., is the inventor of an improved form of nut-lock, which is herewith illustrated and described. It consists in the combination, with a screw-bolt, of a recessed or chambered nut, and a locking-weight fitting in one of the recesses of the nut and serving to oppose by its gravity the tendency of the nut to turn upon the bolt in the direction of release from its bearing upon the member which the bolt secures

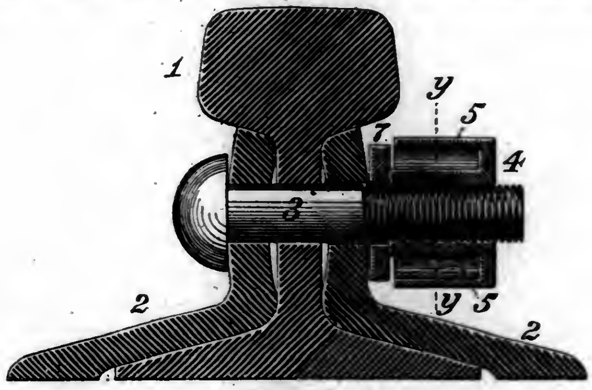


Fig. 1.

URSBRUCK'S NUT-LOCK.

in position. The invention is here shown as applied in connection with a rail-joint, but it is equally applicable in any other construction in which it is necessary or desirable to hold a nut securely against displacement from normal position upon a bolt.

In the accompanying cuts, Fig. 1 is a vertical transverse section through a rail-joint illustrating the application of

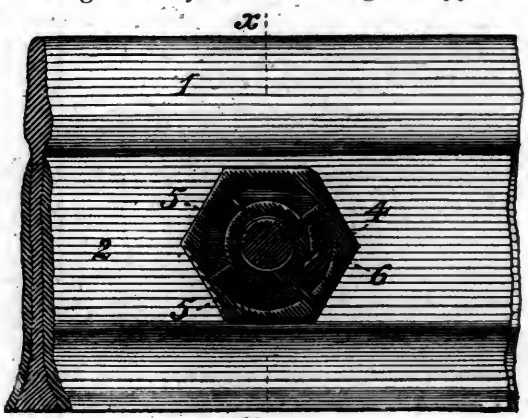


Fig. 2.

URSBRUCK'S NUT-LOCK.

the invention on the line *x x* of Fig. 2; Fig. 2 a side view, in elevation, of the same with the bolt and nut in section on the line *y y* of Fig. 1, and Fig. 3 on the following page a view of the weight detached.

The bolt 3, by which the fish-plates 2, and rail-sections 1, are connected, is provided with an ordinary screw-thread, which is engaged by a nut 4, exteriorly of the usual form, but differing from the ordinary nut in having

a series of recesses or chambers 5, formed within its body between a central core in which the thread is tapped and an external shell, these chambers being separated by radial ribs or partitions, which assist in maintaining proper strength in the nut. The chambers 5, are preferably, as shown, of segmental form, and either of them is adapted to receive a correspondingly-shaped locking-weight 6, which is inserted in one of the chambers and which, when the nut is screwed to a bearing against one of the fish-plates 2, or as is usually the case, against an interposed washer 7, will stand partially or wholly below the axis of the bolt, with its lower end in advance in the direction of the rotation of the nut in being screwed onto the bolt.

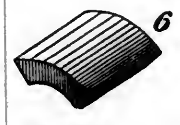


Fig. 3.

URSBRUCK'S NUT-LOCK.

It will be seen that the tendency of the nut to be jarred loose and be displaced by rotating in the opposite direction is counterbalanced by the preponderance of gravity induced on one side of the bolt by the weight 6, and the nut will thereby be held in operative position without the use of a nut-lock, ratchet, or other extraneous device.

It is claimed by the inventor that his device provides a light and strong skeleton nut of the usual form, adaptable to the ordinary screw-threads and capable of being attached and removed by any common wrench without requiring extraneous devices in its application and use.

Chamberlain's Car-Coupling.

COURTLANDT A. CHAMBERLAIN, of Canton, N. Y., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. The device is of that form of coupling in which gravity, without any aid from springs or elastic media, is wholly relied upon for the work; and it consists in a draw-bar provided upon the one side of its head with a projection or arm cast solidly thereon, with a central journal or bearing at its outer extremity, while upon the diametrically-opposite side of the head a laterally-projecting engaging-jaw having a forwardly-inclined contact-face and a rear vertical face is cast, this head being combined with a vertically-swinging coupling-link carrying at its forward extremity a laterally-projecting jaw, whereby when the jaw of the link is forced against the inclined contact-face of the fixed engaging-jaw it rides freely over the apex and drops into engagement at any point with the rear vertical face of the fixed jaw.

In the accompanying cuts, Fig. 1 represents in perspective view the coupling as applied to an ordinary draw-bar, one of the draw-bars being in place upon the end of a box-car while its fellow is represented as disengaged from the adjoining car; Fig. 2 a plan view of the couplings in position between two cars, and Fig. 3 a detailed view showing a preferred construction of the journal of the coupling-link.

A is the ordinary draw-bar, having the shank *a*, about which the ordinary spring is coiled and secured, and the squared or prolonged portion *a'*, for engagement with the bed-frame of the car. It is also provided with the ordinary buffer-head *a''*, having the horizontal link-opening in its face and vertical pin-opening for the common link-and-pin connection of the ordinary freight-car. Upon one side of the head, and cast integrally therewith, is provided the projection B, terminating centrally in a

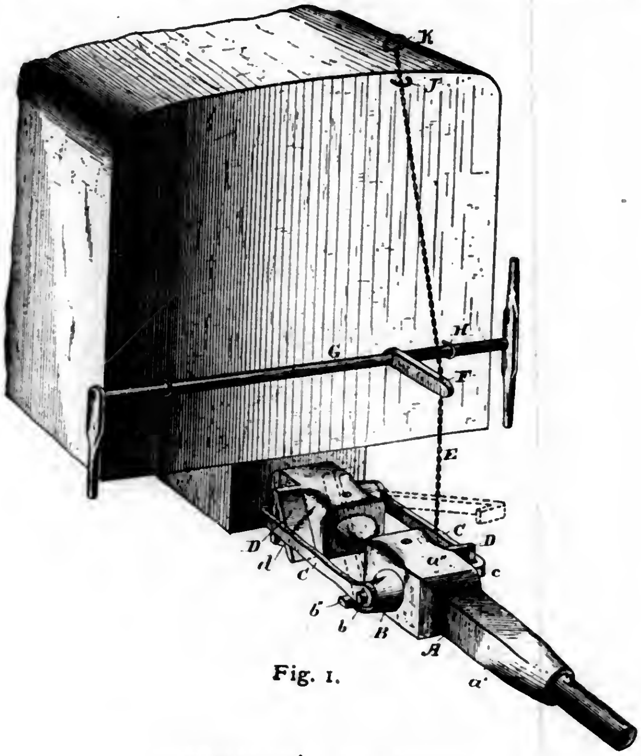


Fig. 1.

CHAMBERLAIN'S CAR-COUPLING.

journal or bearing *b*. This bearing or journal is made of steel or some equally durable metal, and secured in the projection or arm of the head, as shown in Fig. 3, by a key or other locking device *b'*. Upon the lower forward limb of the projection B, is made a further smaller projection or shoulder *b''*, which may be cast integrally with the entire draw-bar and head, or may be preferably at-

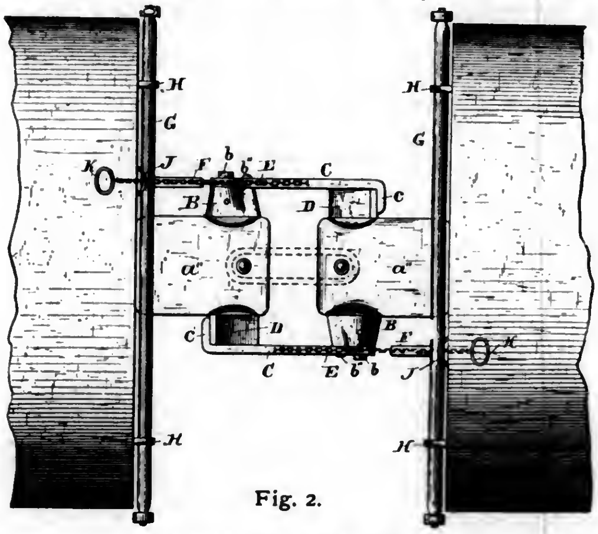


Fig. 2.

CHAMBERLAIN'S CAR-COUPLING.

tached, for security and permanence of wear, as shown in Fig. 3, being also made of steel or other durable metal, and seated within an opening or socket tapped into the projection B, in any of the well-known methods. This shoulder is broad and has an upper bearing-surface acting

as a fulcrum for the coupling-link presently to be described. It has been found, however, that an ordinary cast shoulder upon the projection B, has withstood the severest test of actual service. Upon the journal or bearing *b*, is pivoted the coupling-link C, secured by a locking-pin *b'''*. The forward end of this link terminates in the lateral engaging-hook or jaw *c*. The forward or contact face of this hook or jaw is slightly inclined to enable it to rise freely over the inclined face of its complementary engaging-jaw D, to be presently described. The rear or engaging face of the jaw or hook *c*, is not at a right angle to the length of the link, from which it projects laterally, but makes an angle that is slightly acute to the line of the link, for a purpose which will presently be shown.

Diameterically opposite the projection B, upon the side of the head, projects the engaging-jaw D. The forward face of this jaw is inclined from the vertical, and presents its face squarely toward its engaging-hook C. The jaw D, stands out at right angles to the plane sides of the buffer-head, with its forward or contact face inclined, as before described; but its rear or engaging face

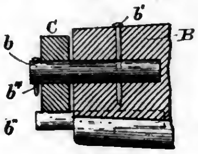


Fig. 3.
CHAMBERLAIN'S CAR-COUPLING.

is not only at right angles to the side of the head, but is also in a plane that is truly vertical. In casting the draw-bar this jaw is made integral therewith, care only being taken that its contact and engaging faces be perfectly smooth. The body of the jaw may be recessed, as shown at *d*, or if preferred it may be made as a solid projection.

Attached to the coupling-links is the chain E, which engages with the rigid arm F, upon the rock-bar G, carried in guide-eyes H, upon the end of the car. The rock-bar is provided with handles at either end, by which the links may be lifted; or if preferred, the uncoupling may be performed from the roof of the car by means of a continuation of the chain to the eye J, through which the end of the chain is kept from slipping by the large terminal ring K.

The operation of the device is as follows: Cars equipped with the coupling as described, on coming together engage automatically the link pivoted upon the projection B, and supported in horizontal position upon the fulcrum or shoulder *b''*, rising easily up the inclined front face of the jaw D, and dropping by force of gravity, as soon as the apex is reached, behind the same and into close engagement with the vertical rear face thereof. Each head being provived with a coupling-link upon one side and an engaging-jaw upon the other, the engagement is simultaneous and complementary. The motion and jolting of the cars serve only to make the slightly undercut rear face of the hook or jaw *c*, engage more closely with the vertical face of the jaw D. This latter jaw, it will be observed, is in vertical height the whole depth of the draw-bar head. The journal of the coupling-link is carried out from the central portion of the opposite side of the head. This arrangement of parts secures the positive engagement of the coupling-jaws not only when the draw-heads come together in the same horizontal plane, but provides for the largest difference in planes of meeting possible to a heavily-laden car coupled to one wholly empty. This advantage is of the utmost importance in couplings of this class. For lack of this high and low ability of engagement many of the couplings heretofore devised are largely inoperative. Dispensing entirely with springs, the coupling-link here used is made of solid metal, so heavy that gravity quickly acts upon it when released from support. By pivoting it to swing vertically and yet engage horizontally with its contacting-jaw in a broad, smooth vertical face a two-fold advantage is secured. The engaging-jaw is also most securely braced and strengthened beyond all ordinary accident, the inclined forward face thereof not only operating to carry the link-hook up to its apex, but also acting in the most perfect way as a powerful brace in support of the working-face, against which the whole strain of the draft is exerted.

The inventor claims this form of coupling to be simple, strong, durable, and automatic in its action; to be free from complicated mechanism, and attachable to cars of any construction and to draw-heads of any form in common use, at small expense. It is also claimed for the device that in the event of derailment the cars will uncouple, which is a most desirable feature of any coupling device. The coupling can be readily attached to any car, and can be used in connection with the ordinary link-and-pin coupling.

Brown's Roll for Reducing Old Rails.

John H. Brown, of Bay View, Wis., is the inventor of an improved roll for reducing old rails, which is herewith illustrated and described. The invention provides a system of utilizing old steel rails of any length, from a broken piece a foot long to a full-length thirty-foot rail, whereby they are "broken down" and converted into merchant steel of square-edged "flats" without showing any seam whatever; and it consists of three rolls having peculiar conformations on the circumferences whereby this object is accomplished. Heretofore the utilization of old steel rails has been attempted, and what are known as "billets" have been made therefrom consisting of square bars of steel; but these billets have shown seams where the flanges of the rails had been broken down against the web or stem in the formation of the billet, and this is a serious objection, to obviate which the present invention is devised. Another system is to cut a rail into three parts by separating the flange and the head, or "tread," by cutting from the web or stem; but this leaves the old rail in three pieces, whereas with the present invention all of the metal of the old rail is utilized in the formation of the flat, and that, as stated, without showing any seam.

The accompanying cut on the following page is a vertical central section of the improved breaking-down rolls.

The breaking-down rolls are three in number, A, B and C, and the rolls A and C, are geared so as to revolve in the same direction, while the roll B, intermediate therewith, is geared so as to revolve in the opposite direction, as indicated by the arrows, the train of gears for accomplishing this object being of the well-known and ordinary construction common to rolling-mills. The roll A, is provided on its operative part between its journals with

seven circumferential guiding collars g g g, etc., of different and gradually diminishing diameters from one end toward the other, as shown. Between the first two of these guiding collars g g, is an operative collar a, while the space between the second and third guiding collars g g, as shown from right to left in the cut, is a blank or even surface g', and so on, the blank even spaces g' g^2 g^3, alternating with the operative collars a c and e, while on each side of these operative collars are circular depressions or circumferential grooves of different depths, marked a^3 a^4, c^3 c^4, and e^3 e^4, respectively, these pairs of grooves growing, generally, shallower from right to left, as shown.

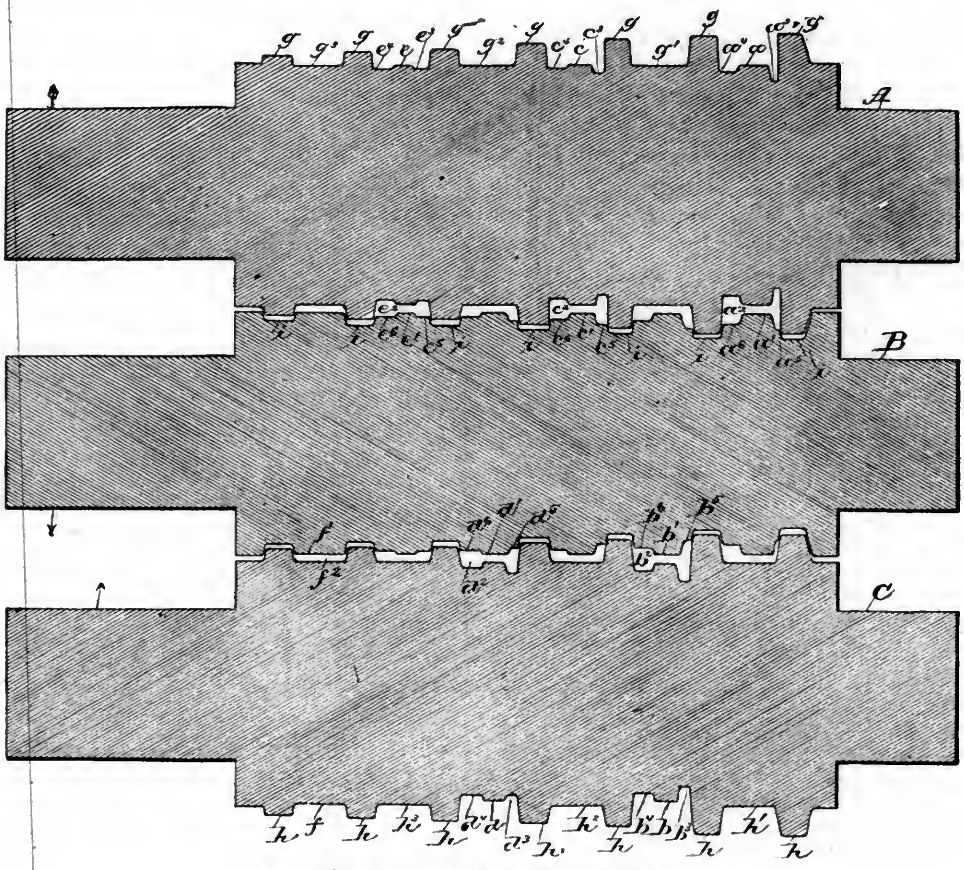
The roll B, is provided with seven deep circumferential guiding grooves i i i, etc., to admit of the guiding collars g g, of the upper roll A, revolving therein, and consequently these grooves i i, grow shallower from right to left, corresponding with the decreasing diameters of the collars g g. Between the first and second grooves i i, always counting from right to left, are other and shallower grooves a^5 a^6, of different depths, having between them the relatively raised portion a', of the same diameter as that of each end of the roll B. Between the second and third grooves i i, are the grooves b^5 b^6, and intermediate higher portion b', of the same diameter as the portion a', just described, and so on, the roll being provided between others of its grooves i i, with the grooves c^5 c^6, d^5 d^6, and e^5 e^6, and intermediate portions c' d' and e', respectively, up to the point between the last two of the guiding grooves i i, which is free from other grooves, but has the level portion f', only.

The roll C, is more nearly a counterpart of the roll A, except that the arrangement of its collars and its circumferential grooves and blank or even spaces is alternate with relation to the position of like parts in the roll A. It has seven guiding-collars h h, etc., corresponding to the guiding-collars g g, of the roll A, three smooth or even surfaces h' h^2 h^3, and an extra even surface f, at the left-hand end, between the last two guiding collars h h, and hence two instead of three operative collars b and d, and grooves b^3 b^4, and d^3 d^4, respectively, on each side of the operative collars.

The operation of the device is as follows: The steel rail or section thereof to be broken down is introduced at the point a^2, between the rolls A and B, which, as stated, revolve in opposite directions, and carry the rail between them, slightly breaking it down; and then the rail is brought back through the space b^2, between the rolls B and C, similarly revolving in opposite directions to each other, and next the rail is carried through at the point c^2, brought back at the point d^2, carried through the point e^2, and finally brought back at the point f^2, which results in the production of a "flat" of steel made from the original rail without the slightest seam or any evidence of its original shape at the beginning of the operation.

The rolls A B and C, are made of cast iron.

The steel "flats" produced from the old rails by these rolls and system of operating the same can be manufactured into the following-named articles: No. 4, No. 5, and No. 6 wire rod; also, one-fourth, five-sixteenths, and three-eighths inch "rounds" and "squares;" also, three-fourths up to two inches in width and three-sixteenths up to seven-sixteenths inch in thickness of round-edge tire; also, the same proportions of square-edge flats, and also into hoops and bands from one to four inches in width, and from No. 14 gauge to three-sixteenths of an



BROWN'S ROLL FOR REDUCING OLD RAILS.

inch thick; hence it is claimed that the improvement is of great value in utilizing what has heretofore been largely waste material.

It is also claimed by the inventor that his system of reducing old rails can be operated at far less expense than the systems now in vogue.

Stetzer's Spring Piston-Packing Ring.

VALENTINE F. STETZER, of Toledo, O., is the inventor of an improved spring piston-packing ring, which is herewith illustrated and described. The invention is designed for use in such places as steam and pump-cylinders, each ring being preferably made entirely from one piece of material, generally of cast iron or of brass, and forming its own expanding or contracting spring, as the case may require, and at its point of severance forming a liquid, gas, or fluid-tight joint or lap, and being made in such a way and by such a process that the ring shall present to the surface of the cylinders against which it presses a perfectly circular form of bearing.

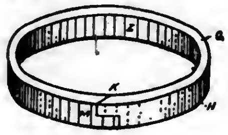


Fig. 1.

Fig. 2.

STETZER'S SPRING PISTON-PACKING RING.

In the manufacture of spring-rings of various kinds by the old processes it is a well-known fact that they are finished in a circular form, which in diameter is slightly larger than the diameter of the bore of the cylinder in which they are to be used, and after being so finished are cut open, generally diagonally, but in a few instances radially, and in cases of the diagonal cut have no tight joint at the opening of the ring, and in cases of the radial cut a joint is often formed by the insertion of a tongue between the cut surfaces in a well-known manner. Rings thus constructed slightly larger in diameter than the diameter of the cylinder in which they are to be used are sprung into the cylinder by compression, which distorts

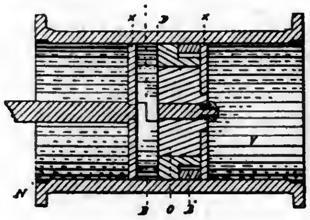


Fig. 3.

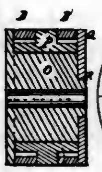


Fig. 5.

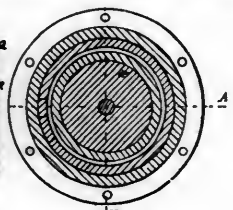


Fig. 4.

STETZER'S SPRING PISTON-PACKING RING.

the circular form of the ring, making it imperfectly fit the cylinder. To obviate this effect and to produce a ring having the qualities before stated—which is, first, the production of a ring which when sprung into the cylinder shall make a true concentric and as nearly a perfect fit as the present arts of construction will permit; and, secondly, to make a true and perfectly-tight joint at the opening or point of severance of the ring—are the primary objects of the present invention.

In the accompanying cuts, Fig. 1 is a perspective view of the spring piston-packing ring, showing the cuts on the open side closed; Fig. 2 a perspective view of a section of the ring, showing the cuts on the open side as the ring appears when expanded to its fullest extent; Fig. 3 a longitudinal section, on the line A in Fig. 4, of a steam-cylinder and its piston-head, the latter being the improved spring piston-packing ring, one of which, B, is shown in section and one, B′, has shown its exterior or circular surface, the latter for the purpose of more clearly showing the cut and lap on its open side; Fig. 4 a cross-section of Fig. 3 on the line D; Fig. 5 an entire sectional view, on the line U in Fig. 4, of the piston-head and its rings B and B′; Fig. 6 a vertical section of a packing-cap and a plunger to a pump on the line E in Fig. 7, embodying an application of the piston-packing ring, the piston-rod having its exterior surface shown instead of being in section, and Fig. 7 a cross-section on the line F in Fig. 6.

In Fig. 1 is shown the construction of the piston-packing ring. This ring is preferably made of hard cast iron or of hard brass, but may be made of any suitable material,

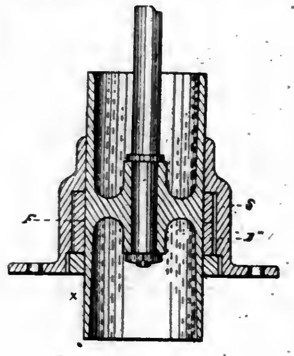


Fig. 6.

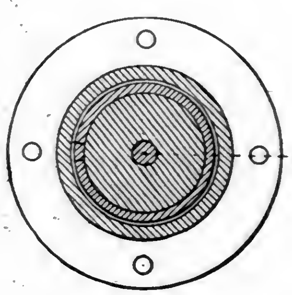


Fig. 7.

STETZER'S SPRING PISTON-PACKING RING.

which may be cast, rolled, or by any analogous process prepared in a circular form of the proper proportions for the completion of a finished ring. The surfaces G H, are first made perfectly true, smooth and parallel, which constitutes the final finishing of these surfaces, being of the proper breadth to fit into its place in the piston-head in which it is to be used. Two radial cuts I J—shown in Fig. 2, one on each side of the ring and each extending, preferably, about one-half way through, and to the extent of meeting each other, for the purpose of severing the ring and the formation of the lap shown at K, in Fig. 1—are next made. The overlapping surfaces I′ and J′, having thus been formed, they are then ground or scraped, or in any suitable way made to fit truly together, still maintaining the parallelism of the sides G H. The ring is then sprung together, as shown at K, in Fig. 1, thus forming an inherent spring of the same metal and making a close joint, which is at all times maintained until the ends of the ring are so far separated by wear as to uncover the lap, which never occurs in use. While held in this closed position the ring is truly bored on its inner surface L, and turned or trued on its outer surface M, the latter to the exact size of the cylinder-bore V, in which it is to be used.

It is obvious that when the ring is sprung together and truly turned on its outer diameter to fit the bore of the cylinder in which it is to be used, the outer surface or periphery of the ring will be concentric with the bore of the cylinder and a perfect fit from the start, and being such a fit at the commencement of its course these relations will be maintained by the future wear of the parts.

In Figs. 3, 4, 5, 6 and 7 are shown applications of this ring. In Figs. 3, 4 and 5 are shown a steam-cylinder and a piston-head, in which N is the cylinder, and O P Q the piston-head, in three parts, supporting the rings B and B′. In this application the rings B and B′, expand outwardly against the inner surface V, of the cylinder N. In Figs. 6 and 7 is shown an application of the piston-packing ring to a pump, wherein the ring B‴, contracts inwardly instead of expanding outwardly, the principle and operation being identical, the operation of constructing the ring only being slightly different, and is as follows: After the operation of constructing the ring, as before described, has been carried to the extent of finishing the surfaces of the lap I′ J′, the ring is expanded with a hammer or other suitable instrument upon its outer surface M, which causes the ring to be closed, as shown in Fig. 1. The operation of completing the ring is then continued as described, the inside of the ring being bored the exact size of the outside of the plunger X, as shown in Fig. 6.

It is claimed by the inventor that this form of spring piston-packing ring is free from the objections common to ordinary packing rings, and that the device is simple and durable, and can be manufactured at small expense.

Hanley's Stock-Releasing Device.

MICHAEL W. HANLEY, of Chicago, Ill., is the inventor of a new stock-releasing device, which is herewith illustrated and described. The invention is designed for the purpose of liberating stock, horses, etc., which may be in a barn or stable at the time of a fire, and not only releases them from the stalls, but alarms them, causing

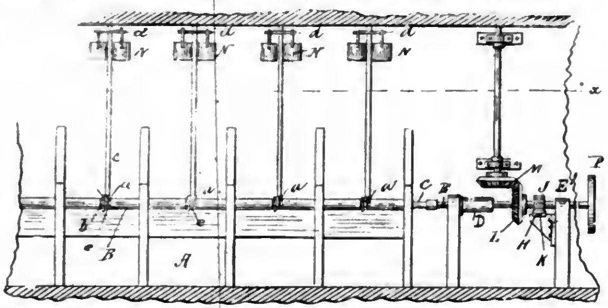


Fig. 1.
HANLEY'S STOCK-RELEASING DEVICE.

them to run out of the stall. It also enables one man to liberate all the stock, whether one or one thousand head, in a very few seconds. It is therefore of utility in street-railway stables, and other buildings where a large number of horses or other stock are kept.

In the accompanying cuts, Fig. 1 is the inside sectional view of a barn or stable furnished with the improved stock-liberator; Fig. 2 a plan section of the same, taken on the line x x in Fig. 1, showing the operation of the liberator on two sets of stalls; Fig. 3 a vertical section of the same, taken on the line y y in Fig. 2; Fig. 4 a detail elevation of part of the sleeve and sliding or locking bar; Fig. 5 a plan section of the same on the line x x in Fig. 4; Fig. 6 a detail section of Fig. 4, showing the parts locked with the alarm attached thereto; Fig. 7 a detail elevation of the alarm and its connections, and Fig. 8 a detail elevation of the sliding or locking bar.

A is the stall or manger; B the sleeve or tube through which the sliding or locking bar C, works; E is the shaft for working the same, and N is the alarm. By means of the mechanism which is provided, the liberating of the stock may be done either from the inside or the outside of the building, or from above or below the stable-room.

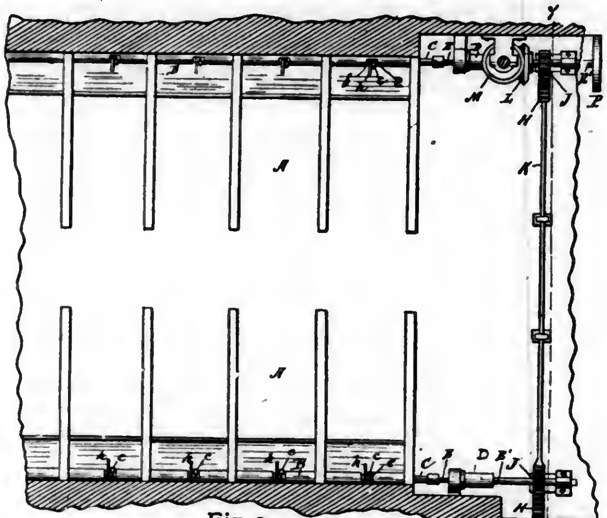


Fig. 2.
HANLEY'S STOCK-RELEASING DEVICE.

Running along the head of the stalls is the sleeve or tube B, arranged with openings a, at proper intervals—*i. e.*, one in the center of that length of sleeve which crosses each stall. In this sleeve or tube there is a sliding or locking bar C, which runs the full length of the

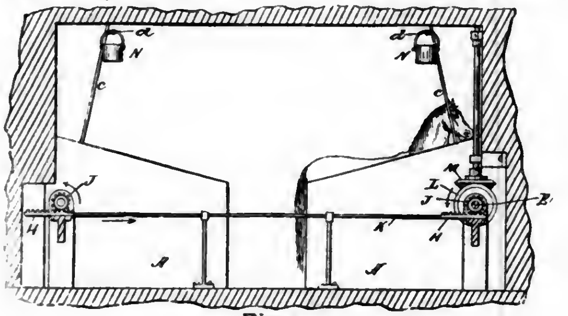


Fig. 3.
HANLEY'S STOCK-RELEASING DEVICE.

sleeve or tube. This bar is furnished with hooks or fingers b, for catching and locking the rings to which the halters are fastened. The sliding bar fits tightly in the sleeve, and the fingers are formed by cutting an L-shaped slot in the bar, the long arm of this slot being parallel to

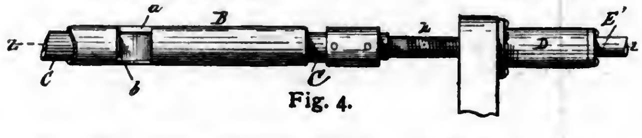


Fig. 4.

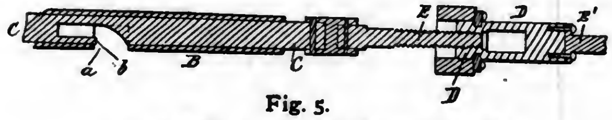


Fig. 5.
HANLEY'S STOCK-RELEASING DEVICE.

the longitudinal axis of the bar, and longer than the width of the opening a, in the tube. At the end from which it is desired to operate the liberator, the sliding-bar C, is connected with a shaft E, with a screw-thread. There is a nut D, fitted with a female screw-thread through which the shaft E, works. This nut is grooved on its outer cir-

cumference, and by means of this groove it is set in a fixed plate, which restricts any lateral motion of the nut. This nut is attached to the shaft E′, which has on its outer end a hand-wheel P, by which the nut is turned off and on the sliding-bar, and as the nut D, is held from longitudinal movement, it is obvious that the locking bar C, will be caused to slide in and out of the sleeve B. The bar C, is made with a spline or feather which runs in a groove in the sleeve B, and prevent the bar from turning. The bar and sleeve might both be made square, or any suitable device used to prevent the bar from turning.

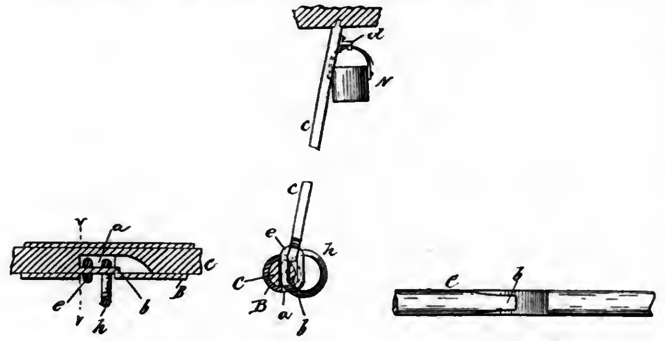


Fig. 6. Fig. 7. Fig. 8.

HANLEY'S STOCK-RELEASING DEVICE.

Attached to the nut-shaft E′, is a gear-wheel J, which engages with the rack H, attached to the rod K. This rod moves forward and backward longitudinally in fixed bearings, and it is at right angles to the sliding bar. As the rod runs by several rows of stalls, several shafts running in sleeves and having gears attached to them may be worked by the nut-shaft E′, and hand-wheel P, there being several racks attached to the rod K, each working a pinion attached to the nut-shafts E′. If it would seem desirable to work the sliding bars either from above or below the floor on which the stalls are situated, the nut-shaft may be furnished with a bevel-gear L, which engages with a similar bevel-gear M, on the end of a shaft extending above or below, as desired.

The cattle in the stable are tied by their halter-straps to rings *h*. These rings are held by the fingers or hooks *b*, attached to the sliding bar C. When it is desired to put in the rings, the sliding bar is run into the sleeve, so as to carry the fingers *b*, far enough along in the opening *a*, to allow the ring or link *h*, to be hooked onto the finger. The sliding bar is then run forward again until the finger extends across the opening and the ring is held in place. There is a rod *c*, which is furnished with a hook *d*, near its upper end, and a ring *e*, at the lower end. The ringed end of the rod is fastened to the finger, together with the ring to which the halter-straps are fastened. The other end of the rod fits into a socket-hole in the wall or ceiling of the stall above it and at its head. To the hook, near the end of the rod, is hung a tin can N, filled with stones.

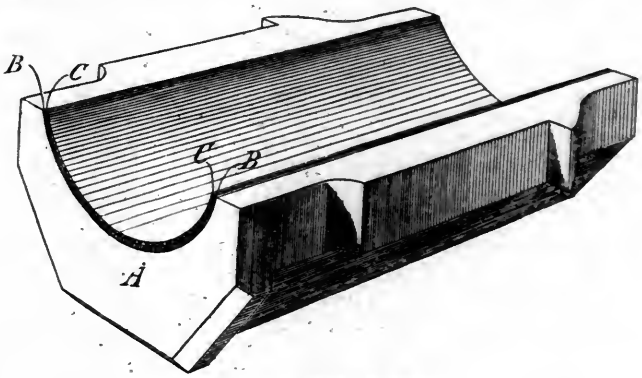
When it is desired liberate the stock, the sliding bar is run into the sleeve by the mechanism already described. As soon as the finger *b*, has passed the opening *a*, the ring *h*, to which the halter is tied, and also the ring *e*, at the end of the rod *c*, are released and fall to the ground by reason of their own weight. When the rod *c*, falls, the tin can N, full of stones, comes down at the horse's head and causes him to back out of the stall, thus letting him see that he is free, and in the general confusion a stampede will naturally be made for the door, many head of stock or horses thus being saved that would otherwise be burned up in case of fire.

The inventor claims his device to be simple and reliable, there being no complicated mechanism connected therewith which would be liable to derangement.

Traylor's Journal-Box.

ROBERT W. TRAYLOR, of Richmond, Va., is the inventor of an improved journal-box or bearing for car-axles and other purposes, which is herewith illustrated and described. The object of the invention is to provide a bearing with an anti-friction surface, and at the same time let the anti-friction metal quickly adjust itself by reason of its soft cushion of lead to the irregularities of an axle or journal.

The accompanying cut represents a perspective view of the device.



TAYLOR'S JOURNAL-BOX.

A represents the end of the brass bearing; B B represent the visible line of the lead cushion, and C C represent the end view of the Babbitt. To cast or form the journal-box or bearing, an ordinary brass bearing or bearing of like composition is taken and its bearing-surface tinned. A proper form with a convex face is then placed and fastened near the bearing-face of the bearing, leaving between the bearing-surface and the convex face a suitable space, into which the melted lead can be poured. The melted lead is then poured between the convex face and the bearing-surface. When the lead has sufficiently cooled, the form is removed and another proper form with a larger convex face placed and fastened, leaving between the lead face, formed as above stated, and the convex face of the last-mentioned form, a suitable space into which the melted Babbitt can be poured. The melted Babbitt is then poured into the last-mentioned space, and thus a well-welded bearing of these metals is obtained.

This form of journal-box or bearing is claimed by the inventor to be simple, durable and inexpensive, and it is further claimed to be the only anti-friction self-fitting bearing made.

THE Florida Southern road is now laying eighty miles of steel rails in place of the iron ones now in use, and to avoid all delay in the running of their trains they have fitted up an electric light machine, mounted on a flat-car, run by a five horse-power engine, and the work of replacing the track is being done at night by an electric

light. The dynamo is capable of furnishing three brilliant lights stretched along the track by poles, which will furnish a good light for more than a mile, thus enabling a very large force of men to work. Another machine similar to this one is being put on at the other end of the road. The reflector, or search light, throws its rays for a half-mile ahead, and a newspaper can be read by its light a quarter of a mile away. These lights will also be used on the new lines of the Florida Southern, where a double force of men will be put on laying the track.

RIEHLÉ BROTHERS, proprietors of the Philadelphia Scale and Testing Machine Works, report the following orders received during the past few days, viz.: Two testing machines for the University of California; one testing machine for Yale College; one cloth tester for Messrs. Hood, Bonbright & Co., of Philadelphia; one improved hay rope twister for the Detroit Pipe and Foundry Company; one improved hay rope twister for the Schuckle, Harrison & Howard Foundry Company, St. Louis; one improved hay rope twister for the National Pipe and Foundry Company, Scottdale, Pa.; one testing machine for Messrs. Wm. Clark & Son, Pittsburgh; a furnace charging scale for the Ohio Iron and Steel Company, Lowellville, Ohio; a rolling-mill scale for the Lebanon Rolling Mill, and many orders for wagon and portable scales, trucks, etc. The prospects for a good year are bright.

GENERAL OFFICES THE ROTE AUTOMATIC BRAKE COMPANY,

MANSFIELD, OHIO, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

GENTLEMEN:—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote-Automatic Brake.* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners, to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As it is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon:

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains:

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner*, so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most horoughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. HARTER, President.

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For ceiling work and for cars (steam or horse) we use from choice, three-ply wood, which is bent to any curve desired, and faced with hard white or bird's-eye maple, silver birch, oak, or basswood. Where it is desired to have the panel dark and ornament light, we can do so, but generally prefer to work on light-wood grounds. The method to be pursued in ordering "MOSAIC-INLAY" is to send correct diagrams, giving sizes of panels and car lines with length and breadth of car ceiling. We will then send you ceiling-panels, ready to place in position, *beautifully decorated with original designs* and at a nominal cost.

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INCREASE OF SPEED IN PASSENGER-TRAINS.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE leading newspapers of the country have recently been calling the attention of the public to the importance of obtaining more rapid transit between the great commercial centres of the Union. It is high time they should do so. The present age is preëminently a progressive one in almost every way, but the attainment of very high speed on our principal lines of travel is certainly a prominent exception. When Dionysius Lardner, some fifty years ago, was lecturing to large audiences, proving to his own satisfaction, no doubt, that transatlantic steam-navigation was utterly impracticable, trains were flying over the Great Western Railway in England, nearly if not quite as fast as now. Some two or three years later the learned scientist's theories were utterly demolished by the successful trips of the *Sirius* and *Great Western* in fourteen days. Since then, their gigantic successors on the ocean, aided by Ericcson's propellor, iron hulls and compound engines, have succeeded in cutting this time down fully one-half. No such radical improvement marks the record of the railways. They too, have had equal facilities for their speed being increased in the same ratio with the steamers, yet the rate attained to day—on English lines at least—shows but little advance on that furnished fully a generation ago.

In the United States, as compared with England, great progress has been made, Speed on most of our railways has rapidly increased, but certainly not in proportion to their ability for making it, considering the v[illegible] advantages gained in this respect by the almost universal use of steel rails, and far greater motive power. There is no doubt that our people fully appreciate the truthfulness of the trite saying: "Time is Money." Knowing th[illegible] it would be natural to suppose that our railway authorities would offer to the traveling public the highest possible rate of speed consistent, of course, with safety. That this is not done can be easily proved by the railway time-tables of the day.

It is probable that at the north the average increase in speed during the last quarter of a century has not been more than thirty per cent., while at the south it has been much greater. Some trains there run nearly as fast as they do anywhere, and some of them even faster. This they are abundantly able to do, the almost total absence of steep grades and short curves on many of them, and the comparatively few stopping places, giving them great facilities for doing so. It is safe to say that since the war of secession the average speed has been doubled, even trebled on most of them. Many instances could be given to prove the truth of this assertion, but one or two will suffice. Less than thirty years ago the regular schedule time of the mail-trains from Charleston to Columbia, 130 miles, exceeded eight hours—it is now only three hours and twenty minutes. The Northeastern Railway, by its route from Charleston to Columbia, is eight miles longer. It runs a daily train between the two cities also in three hours and twenty minutes, being at the rate of 41⅝ miles per hour. This is claimed to be the fastest time, perhaps erroneously, made in the United States by any single line over 100 miles in length. Few persons are aware that when traveling from New York to Jacksonville they go seven miles an hour faster during the southern half of the journey. Mail agents leave Charleston every morning for Jacksonville, Fla., dine there, and return to Charleston in time for supper—a good day's work, as far as distance is concerned, it being fully 570 miles. Everywhere, from Virginia to Texas, is the speed increasing, and there is reason to believe that in a few years the fastest trains in the United States will be running on southern railways.

Very different roads are they now from what they were many years ago, when the writer was employed as superintendent of machinery on one of them in Georgia. Such was the condition of its road-bed that miles of it were in winter under water, or rather a mixture of that element with mud, forming a paste the consistency of cream. The depth of it was sufficient at times to extinguish the fire in the locomotive furnaces. A new set of cross-head brasses were worn out every day in running only 90 miles. That railway now is first-class in every respect, and forms an important link in the through line from Chicago to the south. It is very evident that shortening the stoppages, and making them only when necessary, accounts in some degree for the quick schedules of today. Those who were doomed to travel through the southern states thirty years ago cannot fail to have a lively recollection of the time wasted at way-stations everywhere. A passenger might leave the cars, go into the adjoining woods, shoot a squirrel or two, and leisurely returning, find his train still motionless. If he asked what it waited for the invariably answer was, "Schedule time not yet up." At a well-known stopping place on one of the principal southern railway lines, the time of detention in ante-bellum days was fully half-an-hour. Turning to a time-table of that road for to-day, the writer finds it reduced to one minute only.

It has been well said that misfortunes sometime prove blessings in disguise. The war of secession caused the complete destruction of many southern railways. Culverts, bridges, rails, cross-ties, rolling-stock—everything was swept away. Such injury admitted of no repairing, and they had to be completely rebuilt. All, with few exceptions, were financially ruined, including those which had escaped material injury. Their stock was bought at

a low price by northern capitalists who, with abundant means, have lost no time in making them what they now are, thoroughly "reconstructed" in every way, and probably far superior to what they would have been if they had escaped damage and remained in possession of their former owners. The loss sustained by those owners was immense, but the gain to the traveling public and the country at large is equally so. The rapid progress made by what is called the "New South," has attracted universal attention, and deservedly so; but that progress has in no way been so plainly manifested as in the great improvement of its railways,

All this is encouraging, and goes to show that the average rate of speed has been greatly increased in all parts of the Union; but the stubborn fact remains that the maximum speed attained is no greater than it was in England fully forty years ago. There is only one railway in the United States on which it exceeds 45 miles per hour; and only a few where the regular schedule time exceeds 40 miles. By far the greatest number are content with 30 miles per hour, and even less. The general use of steel rails and powerful locomotives seems to have had but little effect so far as increased speed is concerned. The risk of derailment does not by any means increase with speed; and even if it did, the improved condition of railway tracks, in solidity and smoothness, ought to neutralize this danger. The public is not unreasonable. It would probably be satisfied if provided with one train a day between the principal cities going at the rate of 50 miles per hour, stoppages included—as the extra limited express from New York has been and is doing, without any apparent want of patronage. If such a fast train as this should be provided there would be no more complaints made of slow time. The Post-Office Department could lend a helping hand in bringing about such a favorable result. It might offer for those lines on which its mail matter is the heaviest, a subsidy to be largely increased in proportion to every mile of speed gained. If inducements of this kind were offered, favorable results would soon follow and in this age of lavish expenditure of the public's money, the people generally would not grumble at the additional expense.

A recent writer in the JOURNAL complains, and justly too, of the increasing heaviness of our sleeping and palace-cars. From his account it seems that luxury and weight go hand-in-hand together. Another writer suggests that they might be framed and paneled with sheet metal, but thinks the noise made would be too great. A film of india-rubber would obviate this. Air-cushions might be substituted, covered with some new style of as bestos cloth yet to be invented—in fact the whole interior might be lined with it, rendering all cars in a measure, fire-proof, and thus preventing a repetition of those calamities in one of which, by a sad fatality, a palace-car designed by the lamented Wagner became his own funeral pyre. Still further improvements looking to the safety of the passengers will no doubt be made. Some philanthropic car-builder of the future may design a telescopic car that, when a collision takes place, suddenly contracts to half its ordinary length. Steel cylinders with pistons running lengthwise may be brought into use, and with the aid of atmospheric air will act as "buffers," precisely as those now in use to deaden the recoil of our heavy 15-inch guns. The passengers might find themselves quickly brought into too close a contiguity to be pleasant, but still no damage would ensue to life or limb.

Heavy as our Pullman or other palace-cars may be, their weight is no excuse for a limited rate of speed. The modern locomotive, if its full power was called upon, would prove itself capable of going faster than George Stephenson ever dreamed of It is as near perfection as human skill and ingenuity can make it, and as regards symmetry of appearance, place the American passenger locomotive alongside one of English make, and the comparison would naturally be—a race horse to a rhinoceros.

The truth is, our railway magnates have the Roman maxim *Festina Lente*—it ought to be engraved on their corporate seals — too strongly impressed upon their minds. At any rate they thoroughly carry out its precept and when asked for increased speed prove worthy graduates of the Barnacle school in knowing "how not to do it." Still, the signs of the times are encouraging to the advocates of rapid transit. He should not be too sanguine a prophet who predicts that in the first quarter of the twentieth century most of our railway-trains will travel at a rate of speed fully exceeding by one-half the fastest now known, carrying three times the number of passengers, in cars better ventilated and far more safe in every way; that double tracks will be the rule and not the exception, and that the light of a summer day dawning upon a lightning express train in New York will at its close find it flying through the orange groves of Florida. The world moves, as Gallileo said, and it moves in the right direction.

RAILWAY MEDICAL SERVICE.

BY S. S. HERRICK, M. D.,

SECRETARY STATE BOARD OF HEALTH OF LOUISIANA.

[Written for the AMERICAN RAILROAD JOURNAL.]

SECOND SERIES.--THE UNITED STATES.

VI. THE BALTIMORE AND OHIO RAILROAD COMPANY.

THE medical service of this company was organized in 1880, under the title of "The Baltimore and Ohio Employés' Relief Association." Membership in the association was at first optional, but after February 15th, 1881, it was announced that no one would be employed by the company except on condition of becoming a contributing member, and that no employé over forty-five years of age should be eligible to membership without obtaining a medical certificate of sound health. It was also determined to employ no person thereafter except those in good physical health and not over forty-five years of age. The amount of contribution varies with the monthly wages, but employés are divided into two classes, with reference to hazard of service, the first embracing those in the operating department and the second all others.

The chief features of the association are as follows: 1. A daily allowance for those disabled by accident in the discharge of duty, and an insurance payment in case of violent death. 2. A daily allowance for members unable to work from natural sickness or injuries incurred otherwise

than in discharge of duty, provided that no allowances be made for disablement of less than six working days' duration. 3. Payment of a fixed sum after death from natural causes.

The accompanying table shows the amount of payments in various cases and the benefits to which they are entitled.

jured by the casualties of traffic, both employés and passengers, make physical examination of applicants for employment by the company, and inspect the sanitary condition of grounds, buildings, carriages, baggage, etc. They vaccinate employés and provide appropriate remedies for the relief of such disorders as malarial fevers and intestinal irregularities, wherever they are found prevalent.

SALARIES.	PAYMENTS PER MONTH.	BENEFITS. 1. In case of temporary disablement by accident, while in the discharge of duty, the monthly payment for a period not exceeding six months of Per day.	2. In case of permanent disablement and incapacity to resume employment arising from accident while in the discharge of duty, the monthly payment (after the 6th month) during continuance of such disablement of Per day.*	3. In case of death arising from accident while in the discharge of duty, the payment to the legal representative within sixty days after death of	4. In case of injury or sickness from any cause other than accident while in the discharge of duty, causing total inability to labor, the payments (not longer than 1 year) of a daily allowance of	5. In case of death arising from any cause other than accident while in the discharge of duty, the payment to the legal representative within sixty days after death of †
1. Those receiving $35 and under per month should pay	1st class $1.00 2d " .75	$ .50	$ .25	$500	$ .50	$100
2. Those receiving $35 and not more than $50, should pay	1st " 2.00 2d " 1.50	1.00	.50	1,000	1.00	200
3. Those receiving $50 and not more than $75 should pay	1st " 3.00 2d " 2.75	1.50	.75	1,500	1.50	300
4. Those receiving $75 and not more than $100 should pay	1st " 4.00 2d " 3.00	2.00	1.00	2,000	2.00	400
5. Those receiving $100 should pay	1st " 5.00 2d " 3.75	2.50	1.25	2,500	2.50	500

*Including free surgical and hospital treatment.
†Subject to increase predicated upon surplus at end of each year, now double this stated allowance.

It is provided that no employé can enter a lower grade in the association than the one corresponding to his monthly pay, but any one can join higher grades by paying the amounts fixed for such grades, payments in all cases being deducted from monthly wages. Although membership was at first optional, the association started with one-third of the working force of the company, and the proportion has since increased to more than eighty-five per cent.

In order to insure success to the enterprise, the company generously appropriated $100,000 as a foundation of the benefit system, and gave the services of its officers to perform the necessary clerical work together with office-room. Also, preference is given to the widows, wives, sisters and children of faithful contributing employés for such work as they are qualified to perform, when needed by the company. Free transportation over the lines is given to children of employés when going to or returning from school, for distances not exceeding ten miles; and half-fare transportation to contributing members and their families at all times.

Neither the company nor the association owns a hospital, but arrangements have been made for the admission of members to hospitals at Chicago, Columbus, Pittsburgh, Wheeling, Washington and Baltimore. The association pays for surgical attendance at hospitals and the member pays for his board. As the latter is never more than $2.50 per week, this is more than met by his allowance from the association.

The management of the association is divided between the company and the members, in the proportion of four representatives chosen by the former to five by the latter. The salaried officers consist of the secretary, Dr. W. T. Barnard, and seven medical inspectors. The latter are assigned to specified districts, which they are constantly traversing to investigate cases of disability, the sanitary condition of the lines, etc. They also attend persons in-

Another liberal provision of the company, of a non-medical character, is the furnishing of books at many of the stations, for the particular use of members convalescent from sickness or injury; and these collections of books are moved from one station to another at intervals, in order to afford change of reading. Besides, free reading-rooms have been established at some of the most important stations, provided with writing materials, periodicals and collections of books.

An annuity fund has also been created under direction of the company, to which any employé may contribute regularly whatever sum he may choose. On reaching the age of sixty-five, he is entitled to an annual allowance during life of ten cents on every dollar paid by him to this fund, with the addition of half-a-cent on the dollar for every year his contributions have been made. Thus, beginning at the age of thirty-five he will have paid, at the rate of $5 monthly, $1,800 in thirty years; which will give an annual allowance thereafter of $180, besides fifteen cents additional on each dollar for the thirty years of contribution, or $270 more; both being equivalent to an annual pension of $450. If he stop contributing at any time, without withdrawing payments, he is entitled at the age of sixty-five to his annual allowance of ten per cent. of the amount paid in, together with the half-cent for each year of contribution reckoning from the middle period to the age of sixty-five. In case of death before the age of sixty-five, his legal successor is to receive the whole sum paid in, increased by one-half; and a member has the option of drawing from the fund, at any time, three-fourths of the amount paid in, on relinquishing claim to future participation. Any member between the ages of sixty-five and seventy may receive a sum in one payment equal to five years' allowance, in full settlement of his claim on the fund.

There is also a savings and building feature of the association, which was inaugurated August 1st, 1882. Deposits are received from contributing members of the

association, and their wives, of sums not less than $1 nor more than $100 at one time, on which interest at four per cent. is allowed upon sums of $5 and upwards deposited not less than three months. Contributing members of three months' standing, having deposited $50 or more, may effect a loan at interest of six per cent., to be applied under direction of the trustees of the fund to the purchase of a homestead. The title of the property is vested in the association, or some designated trustee, until the full indebtedness is paid, the borrower meanwhile enjoying the use of the homestead; but on failure of three monthly instalments to the relief feature (which must correspond to an amount payable at death sufficient to secure return of the loan) the property is sold, and the member will receive whatever sum is left after payment of all expenses incurred. Insurance and taxes on the homestead are at the charge of the member during occupancy. The loan is to be returned by payment into the savings fund of not less than one per cent. monthly, until principal and interest are fully settled, through orders on the company applicable to monthly wages. Should the borrower leave the company's service, his privilege on the property remains, on condition of continuing the regular payments as before.

Old readers of the JOURNAL will observe a similarity between the association just described and similar ones instituted by railway companies in France and Italy for the benefit of their employés. The natural outgrowths of such organizations are: 1. Self-denial and economy, to save means for providing future relief and comfort, which imply temperance and orderly conduct. 2. Attachment to the company, which offers advantages proportionate to length of service, and in return more efficient service due to experience and mutual good-will. 3. Extinction of incitements to strikes, reprisals and damage-suits. There can be no reasonable doubt that the Baltimore and Ohio employés are fully satisfied with their share of the arrangement, and that the company has found its interest in the investment of $100,000 to secure contentment, good behavior and efficient service, not to mention decrease of legal expenses.

* * *

The second series of these articles on "Railway Medical Service" appropriately ends with this, the closing number of the fifty-ninth volume of the JOURNAL. During the past month the Pennsylvania Railroad Company has inaugurated a medical service on a plan which promises excellent results, though it is meeting with some opposition from employés, but as the provisions of this service were fully detailed in the last issue of the JOURNAL, further discussion of the subject seems unnecessary, at least for the present.

RAILWAY LUMBER YARDS.

BY W. E. PARTRIDGE.

[Written for the AMERICAN RAILROAD JOURNAL.]

RAILWAY managers often feel that in certain details of railway work subordinates lay too much stress upon unimportant points. Car-builders are frequently thought to be too particular about car-stock and its care and preservation. Many builders would like to have a large lumber yard well filled with timber, with stone foundations for the piles and sheds to cover the whole; this would be a most gilt-edged arrangement, and if a road had a million dollars idle on which it would be glad to realize two per cent., such a lumber yard would no doubt be a fair investment. It is hardly possible to explain the results obtained by the use of dry lumber to one who is not familiar with the subject. For this reason the car-builder, when urging the subject to the attention of his superior officers, labors at a disadvantage. His experience tells him that there is no comparison between green and dry timber, or between timber that has been dried under his own eye and that purchased in the market as dry. It is the difference between an iron and a steel rail with even more in favor of the dry timber than the steel rail. No firm and enduring construction can be made with green timber. It immediately begins to contract, the joints open and the whole structure lacks stiffness. No tightening up will entirely correct this, because timber shrinks in one direction only. Shrinkage changes the shape of the joints, reduces the size of the members, but not their lengths, and distorts openings that have been cut in them. Another evil arises from this shrinkage which is equally serious, and that is rapid decay. The joints opened by shrinkage cannot be closed even by tightening of bolts, and moisture penetrates. Whenever this occurs decay at once begins, and a frame which might be good for twenty years will rot out or lose its strength in six or eight. In the meantime the strength of the green timber work, whatever it may be, is much less than that of dry, it being impossible to frame in such a way as to bring the different members into harmony and make each bear its share of the load. In view of such facts it will be easily understood that even where a road does not intend to build its own cars, it is extremely important to have a yard in which timber and lumber of all kinds can be properly seasoned and protected from rain, snow and the sun.

The question to be decided is just how much expenditure will pay. If a road only builds at rare intervals, a large sum devoted to protecting its lumber will hardly pay. As long as it has to do its own repairs and build plows, cabooses and other special cars, it will pay to expend a moderate sum in establishing a lumber yard and building some sheds and other means of protection.

The following is an outline of what a railway manager can do at his principal car-shop, with economy: Select a spot of ground of sufficient size and surround it by a high and tight fence. A spot with good drainage should be chosen or else one that can be filled up with cinders. The ground must be kept free from water or dampness; this is essential. Tracks are to be laid so that every part of the yard may be reached by a switching-engine. If the yard can have two entrances so that side-tracks come into it from both ends, there will be an item of economy in many cases.

Foundations for the piles are best made of stone so as to raise the bents on which the piles rest eight or ten inches above the ground. If old car-sills are used instead of stone it will pay to coat them with coal-tar. The value of stone or of wood protected from the dampness of the ground is not due so much to the cost of the material as to the inconvenience and difficulty of replacing.

Every car-builder would like to see every stick of his timber under cover. While a complete covering for the lumber yard is no doubt desirable, the advantage of such a cover can hardly be said to pay interest on the capital invested. Although plenty of good reasons for building houses for shelter may be given, the manager may with safety refuse to put up many sheds. Some are needed in which to store certain kinds of stock; these should be good and the roof ought to be tight enough to deserve the name. Such sheds, located so as to act as a shelter from drifting storms for the rest of the yard, are a good investment. A good dry house of moderate size would in many cases be worth more than the sheds and cost less.

Without sheds the yards would be esteemed of small importance by most builders, but a yard without sheds may be made to supply better lumber than one having a few costly sheds and much exposed lumber. The money which is usually expended in building sheds can be better applied in putting a movable roof over every pile of lumber in the yard. The method by which this may be done is suggested by the farmer's hay-stack and roof. Four scantling are placed at the corners of the pile and a roof between them. The pitch of the roof is made to carry the water to the back of the pile. Such a roof can be lowered close to the lumber and will make a good shelter whether the pile is low or lofty. The protection obtained in this way is on the whole quite as satisfactory as that of a shed. The latter must be lofty, and having an open front gives very little protection to a small pile in a driving rain or snow-storm. On the other hand, a pile with the roof sitting close down upon it and having the ends of the timber painted is as well sheltered as in any shed. Light roofs on four posts are sometimes made stationary with very fair results. The protection is not quite as good as that of a movable cover, but the cost is less than a shed and somewhat less than that of a movable roof.

Protection of this kind costs very little, on and some roads in the middle states these temporary shelters have been built entirely from condemned lumber. The cost to the company was only for the labor and nails.

In stacking green lumber away it is well worth the expense to paint the ends so as to protect them from the weather and to prevent end-cracking to some extent. The cost of doing this is not very great, but the advantage is considerable, as may be seen by visiting any large yard. There is an apparently trifling point in regard to laying out a yard where the interference of a superior officer does much harm. The streets and piles ought not to be square with the points of the compass. Placed at an angle, say southeast, the sun has on opportunity at all seasons of the year to shine upon all sides of each pile and into all the spaces between the piles. Even practical men sometimes overlook this small but important matter.

After a suitable yard has been procured, the superintendent, general manager, or some person connected with the directorate of the road, is the only person who can utilize it in such a manner that the road shall gain the full benefit. Green lumber cannot be made dry and suitable for use in six months, nor in a year. Certain kinds of wood are improved by several years of drying. It is therefore necessary for stocks to be laid in a long time in advance of the time at which it is expected they will be needed. In the nature of the case the purchase of stock so long in advance should be directed from headquarters and not left to one who has little knowledge of the general policy of the company.

SMOKE-CONSUMING DEVICES FOR LOCOMOTIVES.

BY J. N. LAUDER.

[A Paper read before the American Forestry Congress.]

In presenting this paper on smoke-consuming devices for locomotives it is not my purpose to enter into the details of the mechanical construction of the various devices that have been experimented with in a practical way during the last thirty years—or to speak more accurately, ever since the locomotive was brought into existence—but to give in a general way what has been done in the past and what is being done at the present time to mitigate the evils of the discharge of unconsumed products of combustion from the chimney of the locomotive.

The smoke and sparks that are discharged from the locomotive are so annoying to passengers that on some of our lines a trip by rail on a hot day is something to be dreaded, and the danger to forests and other property from fires set by these sparks is in the aggregate enormous.

To the novice the remedy for all this would seem to be to so arrange the furnace that perfect combustion would take place. This may be done on stationary or marine engines, where heating surface enough can be provided to allow of slow and perfect combustion, but in the locomotive the weight and size of boiler is limited and artificial means must be used to provide for such rapid combustion as is required when the engine is developing its full power.

The attention of locomotive mechanics has been drawn to this question of fuel-combustion ever since the birth of the locomotive; but their efforts to make it perfect have been only partially successful, and while the heating surface of our boilers is so small in comparison with the requirements of the engines, a forced draft will have to be resorted to. This fact being recognized, it necessarily follows that when the engine is developing its full power the artificial draft is so strong that small particles of coal will be lifted from the fire and drawn through the flues unconsumed and discharged out of the chimney in the form of what is called sparks. The fact that some solid matter will be drawn through the flues from the fires being established, I will now briefly consider the various mechanical contrivances that have from time to time been brought forward to arrest and dispose of these solids.

Amongst the earliest contrivances (when wood was the universal fuel used in this country) was a chimney shaped like a funnel placed with the broad mouth upward. This broad end was covered with a wire-screen, and inside of this chimney was placed a straight pipe somewhat smaller than the smallest diameter of the chimney, its height being about two-thirds that of the chimney. Over this and near the wire-screen was mounted a deflecting plate with edges curving downward. A spark-

reservoir was placed in some suitable position near the smoke-box, and pipes were made to lead from the annular space between the chimney and and the inside pipe to this reservoir. The operation of this arrangement was as follows: The unconsumed products of combustion that were drawn through the flues were driven by the exhaust steam upwards against the curved deflector at the top of the chimney, and the larger and heavier particles were forced down into the spark-reservoir. The lighter particles would pass to the atmosphere through the wire-screen, but would rarely have life enough to set anything on fire. The reservoir, however, was soon abandoned, as it was found in practice that with wood for fuel the sparks were so reduced in size by friction in their passage through the flues and chimney that they could all pass through the screen to the atmosphere with little danger of setting fires.

When coal came to be used as fuel the old arrangement of chimney was found to be unsuitable and new applicances had to be devised, A new and annoying element had to be met—that of gas and smoke, caused by imperfect combustion in the furnace. When fresh coal is added to the fire a vast quantity of gas is evolved, and unless a sufficient quantity of atmospheric air is brought into immediate contact with it it will pass off in the form of smoke.

Various plans to furnish the requisite amount of air, and at the proper time, have been tried; but the varying conditions under which the engine is working have so far made them practically failures.

Letting air into the furnace over the fire, while it will prevent the formation of smoke if let in in sufficient qantity, will also lower the steam-producing qualities of the boiler. Air mixed with a jet of steam driven into the furnace over the fire has been tried at various times and in various ways, but it has always ended in failure. D. K. Clark, the eminent English engineer and author, in his work on the locomotive, describes a method of injecting air and steam mixed, into the furnace of a locomotive boiler to promote the combustion of the gases. Recent so-called inventions brought out in this country are almost exact duplicates of appliances described by Clark long ago.

Rotary blowers have been used to drive the products of combustion from the smoke box back to and into the furnance, to be subjected to a reburning process, but such methods never got beyond the experimental stage. Double or twin furnaces have been tried, but while producing good combustion the mechanical difficulties to be overcome have thus far interfered with their success. Mechanical devices in various forms for driving the solid, unconsumed products of combustion from the smoke-box back through suitable tubes to the furnace were several years ago quite largely used, but they have nearly all given way to more modern and better methods.

I will now proceed to discuss the most improved methods of promoting combustion and also the mechanical means employed to prevent the escape of sparks from the chimney. And hear let me say, curious as it may seem, that wonderful discoveries made in the last twenty years in the production of steel have a direct bearing on the question under discussion.

The substitution of steel for iron in rails and tires has made it possible to so increase the weight of the locomotive that larger boilers can be used, and therefore a very much greater heating surface in proportion to the cylinder area. This fact makes it possible to do what could not be done were soft iron rails and tires still in use.

The modern locomotive boiler has little to distinguish it from its prototype of thirty years ago. All combustion-chambers, water-tables and complications of all kinds have been discarded, and we have the plain rectangular furnace, with plenty of tubes to freely carry off the products of combustion. Its leading feature is its size and large heating surface. Its enormous evaporative power will be recognized when I say that this boiler, when pushed to its full capacity, will convert three thousand gallons of water per hour into steam. To accomplish this amount of work on a grate surface of only eighteen square feet, very rapid combustion must be maintained and this can only be done by a forced draft. A forced draft means imperfect combustion, and imperfect combustion means particles of unconsumed coal drawn through the tubes. These unconsumed solids must be arrested in their course to the atmosphere and deposited in receptacles where their presence will not be harmful. The smoke-box is made twice the usual length; a coarse wire screen is drawn across high enough to be above all the boiler flues; the chimney is a plain, open pipe, smooth aud free from obstructions. The exhaust pipes are carried up through the screen, terminating in a single nozzle. In front of the flues a deflecting plate is placed at a suitable distance from the ends of the flues, and is set at an angle of about twenty degrees. The functions of this plate are two-fold; first, it equalizes the draft through the flues, and second, it deflects the sparks downward, and instead of their being shot upward through the chimney they are banked up in the forward end of the smoke-box, there to remain until they are removed at the end of the trip. In the furnace is placed a fire-brick arch extending entirely across the furnace, and from the flue-sheet under the flues back about two-thirds of the length of the furnace. The gases as they arise from the coal are forced to travel back and over this arch on their passage to the flues, and by the delay thus caused, and also by their contact with the intensely hot fire-brick composing the arch, are very thoroughly consumed. The unburned solids lifted from the fire are also prevented from being drawn directly into the flues, the force of the draft caused by the exhaust steam in the chimney causing them to impinge against the hot brick, where the heat is so intense that a large percentage of them are consumed that would otherwise be drawn through the flues in a solid state. The brick arch is supported on four iron tubes, placed diagonally in the furnace, connecting the water-space under the flues with the water over the furnace crown. These tubes not only make a reliable support for the brick, but best promote the circulation of the water in the boiler.

The arrangement of smoke-arch described is not of recent design, but was patented in substantially its present form about twenty years ago by Mr. John Thompson, of East Boston, who was then connected with the Eastern Railroad in the capacity of master mechanic, It was tried thoroughly by him at that time, but was abandoned for the reason that a comparatively few miles' run would

fill up the smoke-arch with sparks and so interfere with the draft that the capacity of the boiler to generate steam in sufficient quantities to supply the wants of the engine was destroyed. The small furnaces used at that time and the powerful artificial draft made necessary thereby produced this result.

As I stated in a former paragraph, the introduction of steel for rails and tires made the use of larger boilers possible, and with their introduction came the successful use of the spark consuming and arresting devices described. The railroad with which I am connected has had these appliances in use on a limited number of engines for the past two years, and in no case has a forest or other fire been set by them, and if kept in proper order I believe they are absolutely safe.

In conclusion I wish to say that careful and intelligent manipulation of the fire by the fireman is imperative, and will do more to prevent the formation of smoke than any mechanical contrivances.

RAIL PRODUCTION AND CONSUMPTION.

THE statistics of the steel industry of the United States, collected and compiled for the American Iron and Steel Association by its vice-president and general manager, Mr. James M. Swank, is remarkable as showing that the production of Bessemer steel ingots in 1885 was larger than ever before, though the steel rail production then was the smallest for five years. What this means, of course, is that the use of steel for other purposes than rails is making rapid progress. How great this progress is may be gathered by a comparison of the production of Bessemer ingots and rails in successive years, as follows, in tons of 2,240 pounds:

	Ingots.	Rails.	Excess of Ingots.
1874	171,370	129,414	41,956
1875	335,283	259,699	75,584
1876	469,639	368,269	101,370
1877	500,524	385,865	114,659
1878	653,773	491,427	162,346
1879	829,439	610,682	218,757
1880	1,074,262	852,196	222,066
1881	1,374,247	1,187,770	186,477
1882	1,514,688	1,284,067	230,621
1883	1,477,346	1,148,709	328,637
1884	1,375,531	996,983	378,548
1885	1,518,488	959,470	559,017

It is true that the excess of ingots cannot be taken as an absolute measure of the use of Bessemer steel for other purposes than rails, first, because there is some waste in rolling rails from the ingots, but chiefly because in some years, especially in 1880, 1881 and 1882, large quantities of Bessemer rails have been made from imported steel, as might be suspected from the fact that the rails were 77 per cent. of the ingots in 1877, 75 per cent. in 1878, and 74 per cent. in 1879, and in the next three years 79⅓, 86⅓ and 85 per cent., respectively. But since the imports of the materials for Bessemer rails have virtually ceased, in the last three years, the percentages have been 78, 72½ and 63 per cent., respectively—that is, barring the waste in rolling rails, 22, 27½ and 37 per cent. of the Bessemer production of the last three years has been taken for other uses than rails, and last year the takings for these other uses were 70 per cent. greater than in 1883.

This increasing use of steel was due to a very important extent, probably, to the great fall in the price, so that in the first eight months of last year the Bessemer steel was as cheap or cheaper than iron. The increase in the price of rails since has been so much greater than the increase in iron that there is not now the same inducement to substitute steel for iron, though preparations for making such substitutions were never so general.

It will be seen from the above table that the Bessemer rail production last year was 3¾ per cent. less than in 1884, and 25¼ per cent. less than in 1882, when it was largest. These figures do not show the whole decrease in rail production, however, because the production of rails other than Bessemer almost ceased last year. For eight years the production of each kind and the total have been in tons of 2,240 pounds:

	Bessemer steel.	Open hearth steel.	Iron.	Total.
1878	491,427	8,390	288,295	788,112
1879	610,682	8,169	375,143	993,994
1880	852,196	12,156	440,859	1,305,211
1881	1,187,770	22,515	436,233	1,646,518
1882	1,284,067	20,326	203,459	1,507,852
1883	1,148,709	8,201	57,995	1,214,906
1884	996,983	2,384	22,821	1,022,188
1885	959,470	1,250	13,118	973,838

Thus our total rail production last year was the smallest since 1878, and indeed was not very much greater than in 1872 (892,857 tons) when nine-tenths of it was iron. The decrease from 1884 to 1885 was only 4¾ per cent., however, and the amount of decrease was equivalent only to 550 miles of track of 56-pound rails, while the decrease in new railroads constructed was about 825 miles. The new railroads, however, probably did not require much more than 315,000 tons last year, or less than one-third of the total production, leaving 659,000 tons for the maintenance of the 125,000 miles of road and 156,000 miles of track in operation at the beginning of the year, which would permit the renewal of about 3 per cent. of it only.

This seems a very inadequate quantity at first sight but it must be remembered that 49,000 miles of this track had been laid since about the middle of 1880, and by far the greater part of it of steel, so that very few renewals of this could be expected so soon; and we must also remember that at the end of 1885 more than 90,000 of the 156,000 miles of track were steel, all but a small part less than ten years old (because revious to 1875 the total production and imports of steel were only about sufficient for 10,000 miles of track) and that what iron was left was on the lines and parts of lines which suffer the least wear. Nevertheless, it is noticeable that the 66,000 miles of iron track at the beginning of 1885 must have been more enduring than it is usually credited with being, since the total consumption for renewals during the year was but 10 tons per mile of this track, even if no steel track whatever had been renewed—evidence that iron is enduring when it is not much tried. Probably four-fifths or more of the whole gross tonnage movement of the country is over the 58 per cent. of steel track. Evidently most of the iron in track at the beginning of last year was old, because the total supply of iron rails since 1874 had been less than 3,300,000 tons, or about 37,300 miles of track, and for the last six years of that period had been 1,832,304 tons, or about 20,650 miles of track. Thus more than 29,000 miles of the iron track must have been more than ten years old and 45,000 more than six years old. This will all be renewed with steel finally, and probably within a comparatively few years. Indeed, the large orders for steel rails which within a few months have set the steel mills actively at work and advanced the price of rails

from $26.50 to $34.50 are doubtless due chiefly to the need of renewing much of this old iron together with considerable old steel track.

The renewal of one-fourth of the iron track which is more than ten years old will require something like 615,000 tons of rails per year, and this would seem to be a moderate requirement; for though the iron rails are almost exclusively on roads of thin traffic, they are not to any great extent on the roads in new country, having been laid for the most part more than ten years ago, and of course not all by any means on new road then. It is not probable that there are many roads built more than ten years with traffic so light that it will not wear out iron rails, of the wretched quality usually procurable ten years ago, in 14 years.

Doubtless this old iron is mostly on roads which have not only a light traffic, but light locomotives; and where the latter are light enough a very long life for iron rails is still possible; but the light locomotives tend to disappear quite rapidly, though they may last and be the most economical motive-power for a long time yet or even permanently on some of the lines where they have taken refuge and over which there is scarcely ever necessity or possibility of hauling a heavy train.—*Railroad Gazette.*

The Most Northerly Railway in the World.

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IN the report of Consul General Mitchell on the trade of Norway, it is stated that the Ofoten-Lulea Railway, which will, when completed, greatly influence the future of the iron trade of Europe, was commenced last summer at Lulea, on the Gulf of Bosnia, and has made very considerable progress. The contractors confidently expect to have the first section, Lulea-Gellivara (one-third of the entire railway) completed and opened for traffic by the end of 1886. The commencement of work at the Norwegian terminus has been delayed a year, in consequence of a disagreement as to the site of the terminus at Ofoten, necessitating fresh surveys being made. These have now been completed, and the plans, etc., of the Norwegian portion of the line deposited with the Norwegian Government, upon the approval of which work at Ofoten will be commenced. The site chosen for the terminus at Ofoten is on the west shore of Narvig Bay, a commodious and well-sheltered natural harbor at the bottom of the Ofoten fjord, and within a few hours' steam of the famous Lofoten cod fisheries. On account of the influences of the gulf stream, the Ofoten fjord is navigable throughout the year. The length of the Norwegian section of the line is only 28 miles. It will cross the Kjolen Mountains, at the frontier at an elevation of 1,600 feet above sea level. On the Norwegian side the country is very wild and mountainous, but the engineers anticipate no difficulties of an unusual nature either as regards the nature of the country, the severe climate, or the snow. This railway, when finished, will be the most northerly railway in the world.

The railway is being built by English engineers, contractors for the Northern of Europe Railway Company (Limited), which was formed in London in 1883, with an authorized capital of £1,500,000 in shares, and £1,500,000 in debentures. The railway has been most favorably regarded in Scandinavia, except by the Swedish iron-masters, who have opposed it from the first, although the export of these iron ores from Lapland can hardly influence the Swedish iron industry, but could rather compete with the interior Spanish ores from Bilbao.

Economy of Fuel.

THERE is no question that the application of many mechanical devices to locomotives is calculated to effect a saving in fuel, says the *National Car-Builder*. Steam is not used so economically that less could not be made to do the work now done by a greater quantity, and there might be many improvements introduced that would reduce the temperature of the gases being passed into the atmosphere. Skill, ingenuity and perseverance are, however, required to apply the forms of improvement indicated, and great difference of opinion may rationally exist among accomplished mechanical engineers, as to the probable effect of structural changes proposed with the view of promoting economy of heat. But there ought to be no room for difference of opinion about the desirability of accomplishing saving, when all the changes to be effected are the introduction of the means of keeping an accurate record of fuel consumed. It is merely a slight change of method to keep the record of fuel consumed and work done by *enginemen* instead of *engines*, but the curtailment of waste that results from this change is by no means slight.

There is no line of economy in railway management at the present day that promises results equal to that of stopping the rushing leaks resulting from senseless waste of fuel in locomotive firing. We know of no plan that will stop the leakage so effectually as the introduction of the premium system of coal accounts. Putting on traveling engineers well acquainted with the proper methods of firing and fuel-saving might do some good if these engineers would insist on their methods being followed. But it is an excessively difficult matter to get enginemen to change the free and easy style they have been brought up to, and which takes no thought of any higher duty than that of getting over the road comfortably. The proper and only effectual mode of inspiring the enginemen with zeal for fuel-saving is to make them pecuniarily interested in its results.

Metallic Railway-Ties.

AT a recent meeting in Paris of the French Society of Civil Engineers, a paper by M. Post, of Holland, upon metallic railway-ties was read. According to M. Post the principal advantages inherent in the new system, based on actual trial of about twelve years in Germany, etc., were:

1. The average durability of the ties remaining in the track after twelve years' use is much greater with metallic ties of good design than with the best wooden ties.

2. Safety is better guranteed, as the gauge is better preserved.

3. The expense of maintenance is decreased after the second year of the service.

4. The system is rapidly perfecting, so that the fastenings are made absolutely certain and less expensive for

repair and maintenance than fastenings used with wooden ties.

5. The value of the metallic tie when worn out in the service is much greater than the value of an old wooden tie.

In summing up these advantages and combining them with the actual cost of purchase, redemption and interest, M. Post concludes that no country can exclusively use wood for this purpose with true economy; and he cites Holland as proof of his assertion, where wood is still easily obtained, and iron is not too plentiful. He says all Holland companies have adopted the metallic tie.

Railway Mileage in Canada.

BELOW will be found a statement of the mileage of the various railways in Canada in operation on the first of January of this year, as nearly as can be ascertained by the new Canadian journal, *Railway Life* With few if any exceptions these road are all standard gauge. As will be seen, the mileage will compare favorably with that of any other country in the world, considering the difference in population. The names of the roads are arranged in alphabetical order and are as follows:

	Miles.
Albert Railway, N. B	45
Bay of Quinte Railway Navigation Company	15
Canada Atlantic Railway	135
Canada Pacific Railway	3,678
Carillon and Grenville	13
Central Ontario	104
Chatham Railway, N. B	9
Coburg, Peteboro' and Marmora Railway	15
Cumberland Railway, N. S	32
Eastern Extension Railway	90
Elgin, Petitcodiac and Havelock Railway, N. B	14
Erie and Huron Railway	36
Grand Southern Railway, N. B	82
Grand Trunk Railway	2,694
Intercolonial Railway	830
International Railway, Quebec	69
Kingston and Pembroke Railway	61
Manitoba and North Western Railway	130
Michigan Central, Canada Southern Division	376
Napanee, Tamworth, and Quebec	28
New Brunswick Railway	397
Northern and North Western Railway	382
Prince Edward Island Railway	196
Quebec and Lake St. John Railway	46
Quebec Central Railway	148
St. Martins and Upham, N. B.	30
South Eastern	185
Western Counties Railway, N. B	67
Windsor and Annapolis Railway	130
Total	10,027

In addition to those roads in operation there is a considerable mileage on which track has been laid, and which will be open for traffic in the course of a few months, and there will undoubtedly be at least 11,000 miles of railway in operation in Canada by the first of July next.

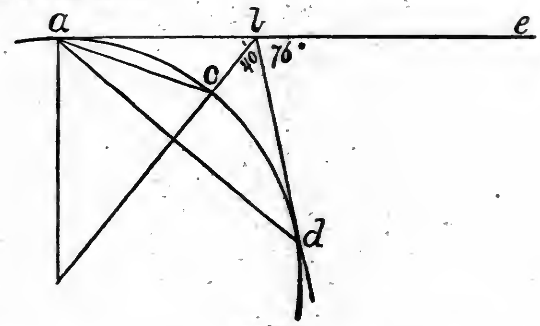
Joining the Volga and the Don.

ACCORDING to *Engineering*, a group of French and Russian capitalists are seeking from the Russian Minister of Finance a concession for cutting a canal between the rivers Volga and Don. These two mighty streams penetrate in their course through Russia within fifty miles of each other, at Tsaritzin, and then strike off, one to the Black sea aud the other to the Caspian. The promoters of the undertaking seek, by the construction of the canal, to give the extensive commerce of the Volga an outlet into the Black sea. The physical difficulties are not insuperable, although sufficiently severe to test the resources of any except a very powerful syndicate. The idea of the canal is by no means new, Peter the Great having personally gone over the ground and made a rough scheme for one. His successors, however, in spite of their enterprise in canal making, have always been averse to the undertaking. In the flood season both rivers are unmanageable, and it has been thought that if a canal were cut, the Volga might some spring burst in the Don, and cause a catastrophe. Of course, with engineering skill, it would be easy to prevent this fear of timid ministers being realized; but it is interesting to mention that nature herself is preparing the way for some such eventuality, the Volga yearly cutting more and more into its west bank and thereby drawing nearer the Don. At present the two rivers are connected by a railway, described by Mackenzie Wallace as the slowest, worst laid, and most infamous in Europe. The traffic is not very large, and even the promoters of the canal project do not think they could carry out their project without a considerable subsidy from the State.

A New Rule for Running Railway Curves.

THE following rule for running curves on railways is sent to the JOURNAL by Mr. Charles Seymour, of Palestine, Ill., chief engineer of the Bloomfield Railroad. Mr. Seymour writes: "I have used this rule with great advantage where the original line has been badly run. To get my data I intersect tangents, bisect the contained angle and run on the bisecting line to the crown of the curve, measuring the distance accurately. The rule may not be new, but I have not seen it anywhere myself."

Given secant — radius = *b c*, and total angle of curvature *e b d*, to find tangent *a b* and radius.



RULE.

As sin angle *e b d* ÷ 4 is to *b c*, so is sin angle 180° — (*e b d* ÷ 4 + *a b c*) to tangent.

As sin angle *e b d* ÷ 2 is to tangent, so is sin angle *a b c* to radius.

5730 ÷ *R* = degrees of curve for 100 feet.

Let angle of curvature = 76°.

Let secant — radius = 40 feet. Thence,

Sin 19° : 40 : : sin 109° : tan = 116.2

Sin 38° : 116.2 : : sin 52° : radius = 148.7

Degree of curve for 100 feet = 5730 ÷ 148.7 = 38° 3′

Log. sin 109° = log. sin 71° =	9.975670	Log. sin 52° =	9.896532
Log. 40 feet =	1.602060	Log. 116.2 =	2.065088
	11.577730		11.961620
Log. sin 19° =	9.512642	Log. sin 38° =	9.789342
Tangent 116.2 =	2.065088	Radius 148.7 =	2.172278

French Opinion of American Locomotives.

A FRENCH work on American railways says: "The style of construction peculiar to American locomotives is not calculated to reduce the fuel consumption to that of European locomotives. The small proportion of heating-surface due to short tubes is as little qualified to utilize

the heat produced by means of large grates as the very restricted use of expansion in the cylinders is to obtain the maximum work from the steam. Consequently, it is not surprising that, while an average of thirty-five pounds of coal per locomotive mile is not considered slow in France, American locomotives still average about fifty-six pounds."

The Introduction of Railways.

THE following are the dates of the introduction of railways in the various countries from 1825 to 1860:

England	September 27th, 1825
Austria	September 30th, 1828
France	October 1st, 1828
United States	December 28th, 1829
Belgium	May 3d, 1835
Germany	December 7th, 1835
Island of Cuba	In the year 1837
Russia	April 4th, 1838
Italy	September, 1830
Switzerland	July 15th, 1844
Jamaica	November 21st, 1845
Spain	October 24th, 1848
Canada	May, 1850
Mexico	In the year 1850
Peru	In the year 1850
Sweden	In the vear 1851
Chili	January, 1852
East Indies	April 18th, 1853
Norway	July, 1853
Portugai	In the year 1854
Brazil	April 30th, 1854
Victoria	September 14th, 1854
Columbia	January 28th, 1855
New South Wales	September 25th, 1855
Egypt	January, 1856
Middle Australia	April 21st, 1850
Natal	June 26th, 1860
Turkey	October 4th, 1860

An Interesting Relic.

THE driving-wheels of the first locomotive engine built in this state, and the third one constructed in America, have been sent from the shops in Albany to the Grand Central depot in New York, for preservation as a relic. On the hub of each in yellow letters is "De Witt Clinton, first trip, August 9, 1831." Each weighs 350 pounds. In diameter they are about 5 feet. From a solid hub in the center, spokes less than an inch in diameter are set, similar to those in a wagon-wheel, but further apart, and extend to a felloe ½ inch thick and 3 inches wide. On the outer edge is a serious of holes which originally held a steel flange in place. The workmanship is crude compared with that of to-day. The driving-wheels now turned out at West Albany weigh 1,900 pounds each, without the tire, or more than five times as much as the wheels of the "Clinton," which was the first engine that made a trip in this country, both of its predecessors breaking down. The engine was kept as a relic in the repair shops at West Albany until ten or twelve years since, when it was broken up and the copper and brass sold to locomotive works.

Economy of Feed-Water Heaters.

THE saving of fuel effected by a good feed-water heater is astonishing, says an exchange. Assuming that boilers are required to furnish 100 horse-power for 10 hours per day for their reasonable life, say 15 years, and that 4 pounds of coal are required per horse-power per hour, and we assume 300 working days per year, which will be 4,500 days for 15 years, then 100 horse-power at 3 pounds per hour is 4,000 pounds of coal per day of 10 hours, and 18,000,000 pounds for the 15 years, which at ¼ cent per pound is $45,000. Now suppose we can save a paltry 5 per cent. of this (there are many who would not consider this worth looking after, and we get $2,250, enough to buy nearly 200 horse-power of boilers; then call it 500 or 1,000 horse-power, and the saving would be $11,250 and $22,500, enough for 50 horse-power for 15 years. The amount of fuel that can be saved by heating the feed-water by the exhaust-steam is shown by the fact that 1 pound of water must be converted into steam to heat about 5½ pounds from 32° up to 212°.

Therefore, 100 horse-power, at 30 pounds of water evaporated per hour per horse-power, would be 3,000 pounds per hour, and 30,000 pounds for 10 hours; and to raise this water from 32° to 212° will require 1 pound additional for every 5½ pounds, and we get 5,545 pounds of water to be evaporated in excess of what would be needed for 100 horse-power if the water was heated up to 212° by the exhaust-steam from the engine; and if the boilers would evaporate 7 pounds of water from 32°, under 70 pounds pressure to 1 pound of coal, we should have to evaporate without the heater 35,545 pounds of water; and this divided by 7 gives 5,097 pounds of coal required in this case, and with the heater 30,000 pounds of water to be evaporated; this, divided by 7, gives 4,285 pounds of coal—a saving of 792 pounds of coal for 100 horse-power, 10 hours—about 15 per cent., which is not quite accurate for these conditions, but very near it, and is the simplest way to show to all the advantages of heating feed-water by the exhaust-steam from the engine. This should awaken those who are pumping cold water into their boilers, or heating it by steam taken directly from the boilers, to the advantage and saving of fuel by using a good feed-water heater. To this direct economy in fuel should, moreover, be added the saving effected by purifying the water.

Locomotives in Italy.

THE following figures, taken from a paper contributed to the Institution of Civil Engineers, shows the number of locomotives placed upon the principal lines of Italy, and the countries where they were constructed:

	Germany, Austria, Switzerland.	England.	France and Belgium.	Italy.	Total.
From 1847 to 1865	36	245	334	87	702
" 1866 to 1875	80	40	267	83	470
" 1876 to 1885	322	36	7	171	536
Total	438	321	608	341	1,708

There are only three firms in Italy which make locomotives, and one of these has recently become bankrupt. An average of 17 locomotives per annum divided among three firms does not seem to indicate any great pressure of business in the Italian locomotive-building trade. The Germans appear to have the greater part of what business there is, but even their contribution only amounts to 32 engines per annum.

A Once Famous Car.

A PARTY of young gentlemen of this city, says the *Albany Express*, journeyed to Poughkeepsie, and being desirous of relieving the monotony of a long ride, repaired to the smoking-car. It was an old-looking vehicle and despite its age and palpable wear and tear it still retained some evidence of former grandeur. The young men noted

this, and one of them remarked to the conductor that "it was a queer kind of a caboose for a smoking-car." "You're right," returned the ticket-gatherer, "I'm sorry to see the old girl come to such a pass as this. It was upon this car that the body of President Lincoln was carried from Albany to Buffalo, upon the occasion of that memorable funeral in 1865. But in one way we keep the recollection of that sad event vividly impressed upon our memories. In one end of the car we have a large photograph of Washington, and in the other one of Lincoln. Both are entwined in flags, and the upper parts of the car are appropriately decorated." "What's the number of the car?" queried one of the excursionist. "No. 450, and she's attached to the two o'clock local to Poughkeepsie every day."

Locomotive Running Average.

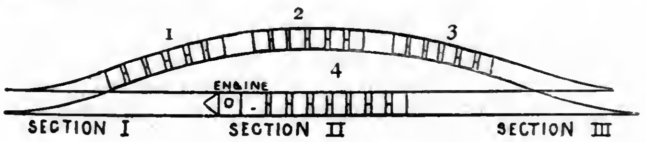
THE prevailing tendency to lengthen locomotive running average considerably above the 90 to 100 miles, which used to be considered about the proper thing, is well illustrated by the locomotive divisions on the Canada Pacific, of which there are 19 on the 2,445 miles between Montreal, an average run per locomotive of 128¾ miles. The shortest and longest runs are:

4 of 112, 113, 114 and 116	miles	respectively.
2 of 118	"	"
4 of 120, 125 and 126	"	"
6 of 130, 131, 133, 133, 134, 134	"	"
1 of 145	"	"
2 of 150, 152	"	"

Thus the minimum is 112 and the maximum 152 miles.

Solutions to the Second Problem in Car-Drilling.

THE following solutions to the problem in switching and car-drilling given in the February JOURNAL have been received. As shown in the accompanying cut, the siding is entirely occupied by three trains, each containing a number of cars, which trains are numbered 1, 2 and 3. The engine is standing on section II of the track with a train of a number of cars, which train is numbered 4, and the engine can move but one train at a time. The problem is to transpose trains 2 and 4, leaving trains 1 and 3 in their original positions, and without making flying switches.



PALESTINE, ILL., March 5th, 1886.

Editor American Railroad Journal:

DEAR SIR.—I offer the following solution to your problem for switching and drilling cars in the February number:

1. Push train 4 well back on section III.
2. Run engine over section II and section I onto siding.
3. Pull out and back up train 1 ahead of train 4 on section III.
4. Pull back train 3 onto section III and push onto section I.
5. Run back over section I and section II to section III, and pull train 1 onto section II.
6. Run engine onto section I back into siding, and push train 2 onto section III ahead of train 4.
7. Push train 1 onto section I back of train 3.
8. Run back through siding and pull train 2 from section III onto siding.
9. Run ahead onto section I, back down section I and section II to section III, and pull up train 4 onto section II.
10. Run back section I onto siding, and push train 2 back onto section III.
11. Run through siding to section I, and pull train 1 onto siding.
12. Run back to section III and ahead to section II, and pull back train 4 to section III, and push it onto siding, next to train 1.
13. Run back to section III, and ahead through section II to section I, and pull back train 3 to section III, and push it ahead onto siding, next to train 4.
14. Finally, run back onto section III, and pull up train 2 onto section II, as proposed.

Very truly yours,

CHARLES SEYMOUR,
Chief Engineer, Bloomfield Railroad.

MONSON, ME., March 6th, 1886.

Editor American Railroad Journal:

DEAR SIR.—I herewith send you solution of problem in switching in the February JOURNAL:

1.	Put	train	4	on	section	III.
2.	"	"	3	"	"	I.
3.	"	"	4	"	"	II.
4.	"	"	1	"	"	II.
5.	"	"	2	"	"	III.
6.	"	"	4	"	"	I.
7.	"	"	1	"	siding	
8.	"	"	4	"	"	
9.	"	"	3	"	"	
10.	"	"	2	"	section	II.

Yours truly,

T. P. ELLIOTT,
Station Agent, Monson Railroad.

Both of the above solutions are correct, although the second would have been easier of comprehension if more amplified.

Other interesting problems in switching and car-drilling will appear in the JOURNAL from time to time.

FOR many years, and until recently, Greece had only one railway and that only six miles long, from Athens to its port at Piræus. An extension of this line to Corinth, about fifty-five miles, was opened in April last, and now a further extension of twelve miles on the way to Patras is opened. This would have been right handy some 2,500 years ago for Athenians visiting the Olympian games. Another, with the classical name of "Corinth, Argos and Nauplia Railroad," is nearly ready for traffic.

THE German raw iron trade has evidently not suffered as severely from lack of demand as that of England and of the United States. Returns just issued by the Association of Germany Iron and Steel Manufacturers show that during September the production of Germany, inclusive of Luxemburg, was 309,243 tons. The production of September, 1884, was 294,330 tons. From January 1st to September 30th, 2,806,322 tons were produced against 2,678,953 tons in the same period of 1884.

THE Boston and Maine Railroad Company has placed a special car, fitted with grooved iron tracks and pins and blocks to chock the wheels of a steamer, at a disposal of the Salem fire-department. It is to be constantly kept beside the depot-platform recently built by the company, to facilitate loading a steamer to send out of town in case of an appeal for help.

THE German Society of Mechanical Engineers offers a premium of 1,000 marks for the best plan for a boiler-shop, in which sixteen locomotive-boilers can be constructed at once; also, a premium of 300 marks for an essay on the best method, according to present experience, for fastening tires on railway rolling-stock.

THE *Organe des Mines* states that the paper rails now being made at St. Petersburg have proved to be extremely durable, while they cost one-third less than those made of steel.

American Railroad Journal.

A Monthly Magazine and Review.

(Established in 1831.)

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NEW YORK, MARCH, 1886.

Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

EDITORIALS.

MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

NEW INVENTIONS.

A GRATEFUL RETROSPECT.

WITH the present number the AMERICAN RAILROAD JOURNAL closes its fifty-ninth volume. Less than two years since it passed into the control of its present management, and its history during that period has been a steady record of progression. At the time of transfer the future of the publication seemed doubtful. It lacked a special of field its own and it numbered scores of rivals. The character which it then possessed, and which to some extent it had possessed ever since its establishment in the dim past, 'way off in 1831, was not suited to the times. The daily press furnished amply all financial news relating to railways, and a monthly publication could in vain hope to acheive success as a record of finance, when its "news" had appeared weeks before in the newspapers. Nearly all of the fields of special railway industries and departments had been furnished with publications devoted exclusively to them, and the JOURNAL lacked a *raison d'etre*—if we may be pardoned for employing a foreign phrase which has no English equivalent.

After serious deliberation it was decided to enter a new field and publish the JOURNAL as a monthly railway magazine and review, containing contributions from able writers and railway experts on the live topics of railway progress, embracing all departments of the service—managerial, mechanical and constructional—such contributions to be written simply and tersely, and in a style that would meet with appreciation in both the railway office and the railway shop. The editorial department of the JOURNAL was to be conducted on similar principles, avoiding the discussion of abstruse financial questions and dwelling on the subjects of interest to railways that are daily presented. In addition it was resolved to reprint a selection or two from the JOURNAL'S contemporaries in each number, and also the papers read before the various railway associations, together with a number of brief items of general railway interest. In other words, it was the aim of the new management to publish a journal which should be essentially a railway publication yet in no way technical—a happy medium between the ordinary magazine and the special exponent of a single branch of railway science.

Our success—to speak in the first person—has been most gratifying. The JOURNAL'S subscription list has greatly increased, it reaches a wider field than ever before, its staff of contributors is steadily enlarging, and letters speaking words of praise and encouragement are daily received. With the greatest good-will to our contemporaries we have received none but the kindest words in return, and we have the satisfaction of knowing that the JOURNAL is steadily winning its way. Among its regular readers are to be found the most prominent railway men in the country, and its successful future in its

chosen field as a railway magazine and review is now firmly assured.

During the past year, embracing the closing volume, we have published in all forty-eight contributed articles on subjects directly appertaining to railways, and almost as many editorials on appropriate topics. An examination of the table of contents for the year, which prefaces this number, will show that the field covered has been a varied one, and that no branches of railway industry have been neglected. In addition, nearly two hundred of the most meritorious railway inventions have been described at length, and we have reason to know that this department has met with great favor both from the inventor and from the reader. The Street-Railway Department, while in a measure separate from the remaining departments, has been conducted in the same spirit and with the same aims, and the JOURNAL is recognized as the faithful and consistent exponent of street-railway interests.

With the April number we shall commence Volume 60, and during the progress of that volume, while the general character of the publication will remain unchanged, many new features will be added. Suggestions as to appropriate topics for discussion are always welcome, and we hope to make the JOURNAL a commonwealth where every reader shall take a personal interest in its contents. We are willing to be judged by our works and with thankful appreciation of all the favors bestowed by the JOURNAL'S many friends in the past, we turn with renewed energy to the inauguration of a new volume.

THE PENNSYLVANIA'S RELIEF DEPARTMENT.

INSTEAD of maintaining their original stand and forcing the provisions of the Pennsylvania's recently inaugurated relief department upon its employés, irrespective of the latter's inclination and wishes in the matter, the management of the road has with sound good sense modified the regulations of the department and requested a free opinion on the part of its employés as to their views on the subject. The result of this action on the part of the management will be two-fold. In the first place, the employés will realize that the department was inaugurated solely for their benefit, and that the company is not only willing to carry out its philanthropic intentions to the utmost, but to do so in the manner most agreeable to the intended beneficiaries; and secondly, having been consulted, and feeling that the success of the department will in a great measure redound to their own credit, it is safe to assume that the employés will enter warmly into the project and coöperate with the management of the road in making the department a lasting source of benefit.

In its fullness and minuteness of detail, and in the range and extent of proposed benefits, the Pennsylvania's relief department is superior to that of any other road, with the single exception of the relief department of the Baltimore and Ohio, which is described at length by a contributor in this month's JOURNAL; and the wise and common-sense action of the management in consulting the wishes of the employés will insure its success. There is a time to be stiff-backed and a time to yield gracefully, and the management of the Pennsylvania has rightly concluded that the present occasion was one where it could yield without loss of dignity. The wisdom of this course will soon become manifest in the cordial coöperation of of the management and the employés.

THE QUESTION OF RAILWAY TAXATION.

THE recent decision of the New Jersey supreme court, whereby the Railroad Tax Bill of 1884 was declared unconstitutional, and the state not only deprived of its expected revenue but also rendered liable for the taxes illegally collected from its railways for two years past, will probably have a salutary effect upon the methods adopted of taxing corporations in the future. It had been the boast of New Jersey, freely and openly made, that the tax upon her railways yielded sufficient returns to meet all the expenses of state government, rendering a general state tax unnecessary, and its supreme court has very properly decided that any tax levied upon one special class of corporations exclusively was not in accord with the constitution of the state.

Just why the railways should be mulcted in this high-handed manner is somewhat difficult of comprehension. It is claimed, and the argument is a most specious one, that railways demand and receive greater privileges than any other class of corporations; that practically a railway is the only corporation for which private lands are condemned, and whose operation decreases the value of private property. Both of these statements are in the main correct, but there is a conspicuous omission of the equally true statement that for every dollar's worth of property whose value is decreased by the operation of a railway, there is a hundred dollars' worth of property whose value is enormously increased thereby. As to the condemnation of private lands for railway purposes it may safely be said that there is never any objection made by the property-owners to the condemnation *itself*, but to the amount of damages awarded; and in view of the immense public benefit conferred in the construction of railways it is but right and proper that the corporations should be protected from the extortionate demands of "smart" land-owners, who if unrestrained would refuse to sell their property save at thrice its real value. In fact, weighing the special privileges granted railways with the

special benefits which they confer upon the public, it will be found that they are entitled to the same favor shown other corporations—no more and no less.

New Jersey is a comparatively small state, and the salaries paid its state officers are moderate. Its legislature is numerically small compared with those of other states, and the legislators receive but nominal pay for their services. Naturally the expenses of state government are not excessive, being estimated at $1,000,000 yearly. It is further to be noted that in proportion to its area New Jersey possesses a greater railway mileage than any other state in the Union, and in fact than any country in the world, and it is quite possible that the tax imposed by the Tax Bill upon its railways would not fall heavily upon the corporations; but the eternal justice of things demands that corporations should be treated fairly and impartially, and that a special tax upon one corporate class alone is a manifest wrong. Therefore the decision of the supreme court of the state is a righteous one, and will, we trust, be far-reaching in its moral effects.

EDITORIAL NOTES.

THE admirable series of articles by Dr. S. S. HERRICK, on "Railway Medical Service," which concludes with this issue of the JOURNAL, has attracted much attention from our readers. The subject has been most exhaustively treated and attention has thereby been directed to the question by more than one prominent railway in the country. Dr. HERRICK is probably the only man who has carefully and systematically studied the subject and collected the information in concise form, and we are glad to say that while the series on the medical service of the United States ends with the present volume, the author has assured us that he will continue to furnish contributions to the JOURNAL on the same subject as fresh information is presented.

* * *

ENGLAND rejoices in the successful completion of a great engineering feat, and the tunnel under the Mersey river is now in operation. The opening of the Mersey tunnel was marked by a royal visitation and all manner of festivities, and, in fact, England has cause to be proud that this undertaking was accomplished before our own Hudson river tunnel had fairly entered on its submarine journey. For once, American enterprise has received a set-back, and we must admit that they do some things better across the water.

* * *

THE dreadful disaster of the Tay Bridge in Scotland, on December 28th, 1879, by which scores of lives were lost, is brought to mind by the approaching completion of the new bridge at the same fatal spot. So soon do horrible calamities pass from the public mind! At the time of the disaster it was thought that the bridge would never be rebuilt, but a few weeks hence will witness trains passing over the new structure with scarcely more than a transient curiosity on the part of its passengers when the scene of the disaster is passed.

* * *

STRIKES and rumors of strikes. Throughout the west and southwest there are signs aud portents of trouble ahead for the railways, and the recent strike on the GOULD system seems to be but the forerunner of other difficulties between railways and their employés. To add to the complexity of the outlook, it is stated that there will be a general strike in every branch of labor on the first of May, the end in view being the adoption of the eight-hour standard. Truly none can tell what a day may bring forth.

CASSELL'S *Magazine of Art*, for April, contains a number of attractive contributions, illustrated with the usual abundance of artistic engravings which characterize the publication. Prominent among them are "Slyfield, Surrey," by Basil Champneys; "A Chapter on Fire-Places," by J Hungerford Pollen; "American Embroideries," by S. R. Koehler, and "Art in Phœnicia," by William Holmden. *The Quiver* and the *Family Magazine*, published by the same house, are also received. "The Autobiography of Benjamin Franklin," "The Man of Feeling," by Henry Mackenzie; "The Rivals" and "The School for Scandal," the two plays being in one volume, "Sermons on the Card," by Bishop Latimer, and "Plutarch's Lives of Alexander the Great and Julius Cæsar," are among the latest issues of Cassell's *National Library*.

The Century's war series is continued in the March number by three interesting papers "Controversies in Regard to Shiloh," by Col. S. H. Lockett and Lieut.-Col. Alexander R. Chisolm; "The Fourth Regular Infantry at Gaines' Mill," by Major William H. Powell, and "A Correction of 'Our March Against Pope,'" by Gen. Longstreet. Gen. Buell also contributes an illustrated paper on "Shiloh Reviewed." Mrs. Van Rensselaer continues her series on "Recent Architecture in America," in a second illustrated article on "City Dwellings," and ex-Minister Benjamin his Persian sketches in "Mountaineering in Persia."

Volume VII of *Outing* concludes with the March number. The steady progress of the publication still continues, and the latest number contains much that it is interesting and artistic. Among the contributed articles of the number is the first instalment of Theodore Roosevelt's series on "Ranch-Life and Game-Shooting in the West," "Moose-Hunting," by Lieut. Frederick Schwatka and T. E. Lambert, and "After Geronimo," by Lieut. John Bigelow, Jr., U. S. A., all being handsomely illustrated.

THE Cincinnati *Graphic* is steadily improving and now contrasts favorably with the illustrated weekly newspapers of the eastern cities. The latest issue received contains a spirited portrait of ex-Senator Thurman.

Street-Railways.

American Street-Railway Association.

President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

First Vice-President.—William White, President Dry Dock, East Broadway and Battery Railroad Company, New York City.

Second Vice-President.—C. B. Holmes, President Chicago City Railway Company, Chicago, Ill.

Third Vice-President.—Samuel Little, Treasurer Highland Street-Railway Company, Boston, Mass.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fifth Annual Convention of the Association will meet in Cincinnati, O., on Wednesday, October 20th, 1886.

THE RECENT STRIKE.

THE past month has witnessed a most disgraceful strike by street-railway employés in New York and Brooklyn, and, despite the temporary success which the strikers seem to have achieved, their cause has lost largely with the public, who, as a rule, are unduly prone to side with labor against capital. Owing to the force of circumstances the street-railway companies have yielded to the extent of submitting to arbitration upon the issues presented, but they have undoubtedly by this time appreciated the fact that a further concession to the insolent demands of their employés will be simple ruin.

We say "insolent demands" and we say it advisedly. No one can question the right of employés striking for higher wages and shorter hours, but such was not the immediate motive of the strike in question. Nearly all of the street-railways had consented to the not unreasonable demands made upon these points, and in many instances these concessions were made without waiting for a formal request. But it is painfully true that organized labor is arrogant, ungrateful and arbitrary. The very fact that the street-railways yielded without a struggle to the demands made for shorter hours and better pay, was a triumph of "honest labor" over "grasping capital," and at once a further demand was made that certain obnoxious officials should be discharged. Had even this impudent demand met with compliance, it is highly likely that other still more outrageous demands would have been made, and unquestionably it would have been better in the beginning if the companies had shown some opposition to the original demands, even though they might have intended to grant them in the end. With rare inconsistency the striking classes are always grateful for what they fight for, but never for what is peaceably given them.

And the pity of it is that the daily press, with but few exceptions—of which the *Evening Post* and *Times* are honorable examples—truckled to the lawless rioters and condemned the police for their decidedly mild interference. It is by no means the only occasion where newspapers misrepresent public opinion, and we are rather inclined to think labor has made a bad move. The outraged public has been aroused, and it will take little more to drive them entirely from the support of the demands of the laboring class, when made by an organized body under the leadership of ignorant, clapper-tongued blatherskites. The individual worker will still obtain the sympathy he deserves, but when led by the nose and by some cheap demagogue whose sole aim is an inglorious notoriety, and incited by him and others of his ilk to acts of violence and riot, he and his fellows become enemies to the public welfare.

The street-railway companies have gone as far as they dare in yielding to the demands of their employés, and the latter had better reflect before they renew their arrogant pretensions. Organized labor has reached the summit of its greatness, and the height on which it stands is perilous. Let it beware of further indiscretion.

THE revelations made before the Railroad Committee of the New York senate in relation to the granting of the franchise of the Broadway surface road are the most astounding that have ever been brought to public notice. There has been more perjury to the square inch before this committee than in any legislative inquiry of the past ten years; but with all the lying and evasion, evidence most complete has been obtained that the franchise was secured through the most barefaced bribery of the honorable Board of Rumsellers who control the welfare of the Empire City. The investigation committee has been most terribly in earnest, and the repeal of the franchise by act of the legislature is practically assured. And in the face of it all the New York aldermen but a few days since calmly granted a score of new street-railway franchises, virtually without recompense to the city. Most earnestly is it to be wished that the city itself could be deprived of its charter, and governed in some other way than by the scourings of gin mills and by disreputable political strikers.

UNIFORMING CONDUCTORS AND DRIVERS.

BY F. MARTIN GAYLER.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE custom of putting the conductors and drivers of street-cars in appropriate uniforms is not common in this country. It is the exception, not the rule, and the occasion is rare when these employés are furnished with any distinctive mark of office other than a small badge, which is often concealed under an overcoat or otherwise invisible.

It is difficult to find any reason for uniforming conduc-

tors and brakemen upon railways that will not apply with even greater force to the conductors and drivers upon street-railways. The intercourse of the street-car conductor with his passengers is certainly more constant and frequent than in the case of the conductor upon the ordinary railway, and the driver too, comes in for his share of intercourse with the traveling public. Certainly there should be provision made whereby the conductor and driver should be instantly recognized, and especially the former. As possession of reins and brake may be considered a sufficient indication of the occupation of the driver, the reasons for putting him in a uniform are not as urgent as in the case of a conductor, but it should be advocated on the ground of symmetry and neatness.

Every street-car passenger has at times experienced difficulty in recognizing the conductor, especially on occasions when the rear platform was crowded with passengers; and on those roads not using the bell-punch or other form of fare-register—they are not many, it is true—there is an uncertainty in the payment of fare as to whether it has gone to the right personage. The average conductor dresses himself in pretty much any manner he pleases, and there is even a great diversity in the style of hats worn. He is hidden behind a pleasing impersonality which more than once is a cloak for some open violation of the rules.

Common-sense calls for the conductors of street-cars to be uniformed in some manner, and also the drivers, though the importance is not so great in their case. The expense of such uniforming need not be great, nor need it extend to the entire clothing. As a rule a coat alone, if sufficiently distinctive, will answer the purpose, or even a uniformed cap provided it be conspicuous in shape and style, and be plainly marked with the word "Conductor." The public has a right to know the company's servants at sight, without the necessity of indulging in guess-work and running the risk of offending some over-nice masculine passenger who would show marked disapproval at being taken for the official in question.

Another point to be considered is the increased discipline which would be inculcated. For some reason not easily explained a uniform does wonders in establishing an *esprit de corps* among employés, and if it be a handsome one there is a proportionate amount of pride displayed in keeping it neat, In sober truth it cannot be said that the average conductor is very neatly attired, nor is there any very great inducement to such neatness so long as he may exercise free choice in his attire; but the possession of a handsome uniform acts as a very great inducement to tidiness and general neatness of appearance. And certainly if it be a point with a road to keep the inanimate car in a state of neatness there are equally good reasons why the animate conductor should be correspondingly neat.

Altogether there seems to be every reason why conductors and drivers should be uniformed as attractively as possible, and we may hope that the subject will be among those selected for discussion by the American Street-Railway Association at its next session, and that some definite conclusion may there be reached as to the advisability of recommending the measure. The subject is at any rate entitled to careful consideration by street-railway managers.

DISEASES COMMON TO CAR-HORSES AND THEIR TREATMENT.

[Report of the Special Committee read at the recent Convention of the American Street-Railway Association.]

(*Concluded.*)

THE next group of diseases which we will consider is known by the term colic. The knowledge of colic in its various forms is of great importance to owners of horses and managers of large stables. The frequency of its occurrence, the intense severity of the attacks, the pecuniary loss so often involved, the difficulty of prevention by prophylactic means, together with the fact that it is to colics, principally those of indigestion, with or without overloaded intestines, that the greatest amount of mortality among car-horses is due—therefore warrants a careful study and consideration.

The term colic in its etymological sense relates to that portion of the intestines known as the colon, but in the present nomenclature of diseases it is applied to all the acute varieties of pain independent of inflammation and structural lesions that affect the digestive organs contained in the abdomen.

This method of denominating several varieties of disease under a single name from the fact that they have some symptomatic feature in common, causes confusion in the study of the diseases and presents difficulties in describing the symptoms and the diagnosis. We will, therefore, consider the several varieties of colic under particular names which either denote the causes or the locations of the pain. The forms that we will consider and that are most frequently met with in our car-stables are the *spasmodic* or *nervous*, the *tympanitic* or *wind*, and the colic due to impaction of the food or fæces in some portion of the intestine.

We will first consider the general symptomatology of colics, and then study the particular forms with their differential diagnoses. The commencement of an attack of colic is usually sudden; at times the attack begins by the patient manifesting a degree of languor and dullness; if in the stable, he stands back at the end of the rope of his halter and looks around at his flanks; if on the street and in harness, he will not show his usual spirit in driving, will not respond to the bit or whip, will knuckle over on the hind fetlocks and possibly stumble. But, whether the attack appears suddenly or slowly, the horse soon becomes restless, and paws and stamps on the ground; if in the stall pulls his bedding back, flexes his fore-legs, hesitates to lie down, although making the attempt, and finally lies down, either to roll once or twice and then get up, or remains down extending all four legs against the stall resting flatly on the sides, or possibly lying entirely upon his back. These positions are not continued long; he soon rises up, moves about, paws and perhaps lies down again and rolls, at times expressing his suffering with moaning and grunting. The countenance is always anxious and contracted, the eyes are dilated and at times fixed, the nostrils are widely opened, and the whole face expresses pain and suffering. In some cases the paroxysms are intermittent and there is a time of rest to the animal when he remains quiet, although presenting an anxious and expectant look, when in a short time another paroxysm of pain takes place. While in others the pains are con-

tinuous, the animal is in constant and wearisome motion, getting up and down, pawing, stamping and looking at his flanks. The movements and struggles are more or less violent, according to the severity of the pains. Every horse, however, has his own peculiar form of attack, and his special mode of exhibiting his distress, and the general manifestation will be modified according to the individuality of the patient.

The temperature in all colics at the onset is normal, but may rise a degree from the labor and excitement as the pain continues; the respiration is accelerated, and remains so to the end of the attack, whether fatal or favorable.

The pulse is, as a rule, hard, small and often irregular, and the arterial tension below the normal, while the heart's action becomes decreased; when the disease has progressed somewhat the heart becomes accelerated, but the pulse remains hard, small and thready; this is especially noticed in those cases that terminate fatally. In the first stages there is often a profuse perspiration, and in those cases that are approaching dissolution there will be a profuse sweating and a cold icy feeling over the entire body.

Certain cases of colic, either by treatment or a natural reaction, recover; the point at which a cessation of the pains takes place is shown by a free expulsion of gases or fæces. or a copious evacuation from the bladder. The intense expression of the face passes away and the animal frequently shakes himself and begins to munch hay, while in other cases, even with the best care and treatment, the struggles become more violent and rapid, the symptoms of pain become more aggravated and decided, the animal seems to become unconscious and regardless of the attendants and objects about him, the respiration becomes more accelerated, the pulse, at first hard and thready, becomes less distinct, and finally almost imperceptible; the mucous membrane becomes injected and a cold perspiration covers the whole body. At the approach to a fatal termination a deceptive appearance presents itself; the animal becomes quiet, stands with head out-stretched and seems to be in relief; but there is still the characteristic expression in the face of extreme pain, the respiration although not so labored is quickened, the pulse is almost imperceptible and possibly pulseless; the animal lies down carefully, stretches his legs, and with a few struggles and convulsive efforts expires; or at times they persistently stand, the muscles of the shoulders and hips will be seen to quiver, the animal will reel and suddenly fall forward, and with a struggle is dead.

During even slight attacks of colics the functions of the gastro-intestinal canal and of the bladder are suspended, there is a paralysis of the muscular coats of these organs, and as a differential diagnostic point it is well to remember that in all intestinal and stomachic colics the functions of the bladder are checked, and that although the animal may present the desire to micturate, still, the trouble is not in the bladder but in the stomach or intestines.

The differential diagnosis of colics is, as a rule, exceedingly difficult. Still, although there are many attitudes and actions common to the numerous forms which manifest themselves by colicky pain, there will always be present some special characteristic symptoms which will aid us in making a correct diagnosis, and it is very essential to make a correct decision at the outset and then proceed with the proper treatment.

The first form of colic, the symptoms and treatment of which we will consider, is the nervous or spasmodic, and this form generally manifests itself some time after eating or drinking, and often after a long drive. The morbid condition is considered to be spasm, and its seat is therefore the muscular coat of the stomach or intestines. The spasm may be preceded by paralysis of a portion of the intestines, and may be produced by causes which act directly or indirectly through the nervous structure.

The pains produced are intermittent and vary in intensity, and continue from two to six hours. The abdomen is retracted, respiration accelerated, pulse is quickened, but presenting fullness under pressure, and continues so unless approaching a fatal termination, when it becomes small, hard and thready. When exercised, motion is not painful and in some cases seems to afford relief. The pains and paroxysms in spasmodic colic are very severe, and the animal during the spasms will throw himself down with great violence and quickly jump up and at once commence pawing or moving about in the stall. Then there will be a cessation of the pain and the animal seem relieved; but in from five to ten minutes there will be a return of the spasm and the animal will again undergo violent exertions. The temperature is always normal or but slightly increased if the animal has been suffering for a length of time. The abdominal muscles are frequently retracted. Care should be taken to discriminate between spasmodic colic and peritonitis or inflammation of the bowels; in spasmodic colic the pains are not continuous and are more violent. There is but very slight increase in temperature, while in peritonitis the temperature is always increased. Spasmodic colics are generally attributable to the local irritation of the ingesta; it may arise from indigestion either from excess in quantity, or from the indigestible quality of the food. It frequently follows exposure to cold or fatiguing exercises, but these causes probably act by occasioning indigestion. Certain foods with particular horses will give rise to spasmodic colic in consequence of an idiosyncrasy which is inexplicable.

This form of colic, although attended with great and protracted suffering, is not considered fatal. It is one of those violent functional affections from which recovery takes place rapidly. It has no tendency to eventuate into inflammation or any other disease, but in proportion to its duration it is followed by fatigue and weakness, and more or less abdominal soreness may remain; and should the attacks be repeated in the same animal he will become weak and emaciated, and if they be not checked or relieved he will die from exhaustion during an attack.

The treament in spasmodic colic has two objects: first, to check the spasm, and, second, to relieve the pain, and thus prevent undue exhaustion. Chloral hydrate has been found the most efficacious medicine and presents the best results; it should be given in the form of a ball composed of chloral hydrate, one ounce, pulverized lobelia, one drachm, and sufficient honey or simple syrup added to form a mass. This in most cases will be found to relieve, but should the pains continue for an hour or more another ball composed of half the quantity given above, or a drench, which the writer has found to act with excellent results in those that are persistent, composed of

chloral hydrate, one-half ounce, and opei tincture, one ounce, in about a pint of water. In most cases the administration of the ball alone will, in about fifteen minutes, relieve the pains and produce quiet and peaceful sleep.

THE TYMPANITIC

form of colic is not difficult to diagnose and is recognized by the swelling and tympanitic condition of the abdomen. It first presents the usual symptoms of all colics, namely, uneasiness, pawing, a desire to lie down, when if the ear is placed to the right flank the formation and passage of gas from one portion of the bowels to another may be heard, and soon there will be noticed a distension of the abdomen, and with the continued formation of gas the flanks and abdomen become hard, resisting, and more or less resounding on percussion. The animal exhibits great pain and assumes many positions, at times throwing himself down with great violence, and it is during these efforts that complications arise which prove fatal. Such as the rupture of some portion of the intestines or stomach, laceration of the diaphragm or distension, and rupture of some of the larger blood-vessels, producing internal hemorrhage.

This form of colic is due to indigestion with fermentation. The stomach and bowels are torpid, the food undergoes fermentation and gives rise to the accumulated gases. Again, other causes are foods that are of poor quality or have become heated or fermented. Water taken into the stomach while the animal is warm or exhausted after violent exertion, or over-loading the stomach in cases where the animal gains access to the feed-box, frequently give rise to this form of colic. It is common in cribbers and is an evidence of the bad condition of their digestive apparatus. Frequently the formation of gas takes place in the stomach and the distention of the bowels is not so apparent. This condition may be recognized by the regurgitation of the gases in the throat.

In the treatment of this form of colic prompt action is very essential. If the distention is great, relief should at once be given by recourse to the trocar and canula; this is an instrument composed of a silver tube or canula about eight inches long and one-quarter of an inch in diameter, into which is inserted a round steel rod or trocar, one end of which is pointed and the other end inserted into a handle, the pointed end projecting beyond the canula about half-an-inch. This instrument then is inserted through the skin and into the large intestine called the colon; the point for inserting is on the right flank and is at the point of an angle formed by drawing two diagonal lines downwards, one from the external point of the hip and one from the last rib, and the point at which they meet will be the point at which a puncture can be made. When the trocar and canula have been inserted almost to the full length the trocar is withdrawn and the canula allowed to remain, when the gas contained will escape and with such force as to produce a distinct whistling sound.

To relieve the gas that has formed in the stomach and the small intestines, four or five balls composed of six drachms each of pulverized wood-charcoal rolled up dry in tissue-paper will act to absorb it. Also give to the animal a drench composed of:

Opei Tr.	2 ounces,
Belladonna Tr.	2 drachms,
Ammonia Spr. Aromat.	1 ounce,
Soda Bi. Carb	4 ounces,

to which add about a pint of water; and should the horse not gain entire relief in one or two hours, the above drench may be repeated. Should the distention continue and the animal seem greatly distressed and respiration quickened, he should then be again punctured with the trocar and canula. There should be no hesitancy in puncturing. There is but one unpleasant result that may follow, which is the formation of a smell abcess at the point where the puncture was made, and that should be opened at once with a sharp scalpel and bathed with hot water several times a day. But this seldom follows, especially if care is taken to withdraw the canula quickly when the flow of gas ceases.

The other form of colic which we will consider is that due to impaction of the ingesta at some portion of the intestine; this impaction may occur at any portion, either in the large or small intestines, or even the stomach.

The symptoms are not difficult to distinguish and the history of the case will be an important factor in the diagnosis.

The animal is dull, refuses food and sometimes water, paws the bedding and occasionally lies down, remaining for a time and then rising to commence pawing again. The respiration in the first stages is not accelerated, but if the animal continues to suffer two or three days it becomes quickened. The pulse is quickened and full at the commencement, but if the impaction continues it becomes hard and thready. The history of the case will reveal the fact that the animal has not defecated freely, and has been dull and dejected. The symptoms are not violent as in spasmodic colic nor is there any tympanitis as in wind colic.

The etiology of this form of colic is in most cases obscure. In some cases it is due to over-feeding and not sufficient work. Horses that are convalescing are permitted to eat large quantities of hay, and perhaps their bedding is affected with it.

Animals that are debilitated either from age, overwork or sickness, lack force and tonicity in the peristaltic action, and the result is impaction of the food at some weak point of the bowels, and to this impacted ingesta is added all the food that the animal may take before showing distress. The treatment should always be heroic. Purgatives should be given at first in the form of raw linseed oil, one and one-half pint, and give injections of warm water and soap containing two ounces of the tincture of barbadoes aloes every three hours. Should the bowels not show any response in from ten to twelve hours, a physic ball should be given composed of aloes barb. pulv., one ounce, nux. vomicæ pulv., one drachm. And a nerve tonic in the form of tincture of nux. vomicæ, one ounce, tincture belladonna-leaf, two ounces, water sufficient quantity to make eight ounces, and give an ounce every three hours. If the animal is weak and seems exhausted, a drench of one ounce of alcohol and eight ounces of water should be given every four hours. The principal object should be to endeavor to induce an action of the bowels, and when the diagnosis of impaction is made all efforts should tend to promote the action of the bowels.

The prognosis is always doubtful and most cases of impaction are very persistent and frequently never respond to treatment. The animal will continue to suffer from four to eight days and then die.

There are other conditions which give rise to colicky symptoms, but from the fact that they are not of frequent occurrence in our railroad stables, and the time necessary to describe them being beyond our limit, we will simply mention them and advise that, in cases of colic which present symptoms of an unusual and remote character, a competent veterinary surgeon be employed to treat them.

INVAGINATION,

or the condition where one portion of an intestine is pushed into a portion adjacent, is either due to a lack of peristaltic action in one portion or to the calibre of a portion of the intestines becoming enlarged, and the part next to it being received into it. This condition when it does occur presents persistent colicky pains and frequently terminates fatally.

Foreign bodies taken into the stomach by the mouth, producing irritation or the formation of calculi, give rise to colicky pains that are often obscure and difficult to diagnose.

The various forms of hernia, either scrotal, inguinal or rectal, will produce colicky symptoms requiring the prompt attention of a competent veterinary surgeon.

CEREBRO-SPINAL MENINGITIS.

The name cerebro-spinal meningitis denotes an inflammatory affection of the vascular membrane or pia mater, which surrounds the brain and spinal cord; but the disease among car-horses and other classes of horses is infectious and affects a number of horses over a large area, and should most properly be termed "epizootic" cerebro-spinal meningitis.

This diseased condition, which should be considered as an essential fever; presents various symptoms and is often confounded with the sporadic cases of traumatic-spinal meningitis, with azoturia cerebral hemorrhage, with motor paralysis, (which diseases we will be unable to consider in this article) and with other conditions which produce paralysis, from the fact that they have the symptoms of motor paralysis in common; and it is from this fact also that so many errors have been made in regard to this disease and its treatment.

In the majority of cases of cerebro-spinal meningitis an exudation of a gelatiniform character is found in the meshes of the pia mater of the brain and cord, and the extent of the exudation varies in different cases. It may be found in scattered patches over the whole of the membrane, or more frequently it is found at the base of the brain and in the sacro-lumbar region of the cord. The substance of the brain and cord is usually hyperæmic, and is the seat of small hemorrhogic extravasations.

In those cases which terminate in a few hours the anatomical evidences of the disease may be very slight or entirely absent.

The characteristic features of this disease are very destructive. In many cases it commences with a sudden attack, the animal being at once stricken down with grave symptoms, complete loss of motor power, at times preceded by staggering and knuckling over of the fetlocks. If in the stall, the animal is noticed to stagger and stumble forward when endeavoring to move from one side to the other; or if on the road and in harness, the animal will be noticed to make missteps and be unable to control the movements of the hind feet, when soon the animal will fall and be unable to get up. When down the animal usually struggles very violently, although in some cases coma takes places early and then the animal remains almost motionless.

The pulse and respiration are usually quickened. The temperature at the outset of the disease is usually normal and frequently below normal; but after the disease has continued the temperature becomes elevated, although in many cases the pyrexial symptoms are variable, and there is considerable difference of opinion among authors as to the temperature in this disease; but, in the writer's practice, it has been found that at the first attack it is normal or below, and after the first, second, or third day the temperature becomes increased according to the severity of the symptoms.

The pupils of the eyes are greatly contracted and if the optic nerve be examined by means of the opthalmoscope, it will be found to be highly congested. The animal is acutely sensitive to external noises and impressions, and seems to be conscious of great pain when moved or when pressure is exerted along the spine over the lumbar region. The urine is retained until by the pressure of the extended bladder it is forced out in small repeated quantities. The fæces are retained and the bowels are usually torpid.

The severity of the symptoms and the duration and progress of the disease are very variable. In some it may be sudden, the horse falling with complete paralysis; coma may set in during the first six hours and the ainmal die within twelve hours from the first signs of the attack, or the development of the symptoms may not be so acute; the animal may be somewhat dull and inactive, appetite may be wanting, and the first day or two may also present a slight stiffness, with some knuckling over upon motion; and upon the third or fourth day there will be a loss of control of the hind extremities, with finally paralysis of the muscles of both extremities and contractions of the facial and cervical muscles.

In those cases where the paralysis is almost complete at the first recovery is very doubtful. And in those where the symptoms are gradual, if there are no complications, convalescence may take place during the second or third week of the attack, and it is generally tedious and the animal remains weak for a considerable time. Remissions occur and they vary as regards their time of occurrence and duration. Pulmonary complications also occur during an attack which usually proves fatal.

The pathological character of epizootic cerebro-spinal meningitis is embraced in the statement that it is an infectious disease and belongs among the essential fevers. The inflammation of the pia mater of the brain and cord is a local manifestation, or an effect of a general morbid condition. Of the nature of this general condition we have no positive knowledge.

There are few epizootic diseases so destructive to horses as cerebro-spinal meningitis, and more especially during the first outbreak the death rate is very large. The prog-

nosis in all cases where the symptoms are severe is exceedingly grave.

In the treatment there can be no definite prescription laid down, from the fact that we are not familiar with the causes of the disease. Various potential therapeutical agents have been employed, but no reliable or curative treatment has as yet been discovered.

Experience has, however, shown the utility of certain measures, in the use of which one should be governed by the rational and symptomatic indications presented in each individual case. For those horses that have been attacked in full health, that are plethoric and presenting a strong and full pulse, blood-letting will be serviceable and a ball composed of pulverized barbadoes aloes, eight drachms, should be given. But if the animal be anæmic and with a pulse that is readily compressed, blood-letting would be contra-indicated. In very severe cases that express great pain, the tincture of opium in two ounce doses, repeated every four hours, has been found by some writers to afford great relief; but the use of chloral hydrate in half-ounce doses, together with bromide of potassæ, two drachms, given every four hours, has proven more effective to relieve the pain, and does not interfere with the dose of aloes which is given at the outset. The application of cold to the head and spine is always advisable, and one of the best methods is to apply bags containing finely broken ice to the head and along the spine.

During the first days the animal should not be put in slings unless able to stand; then it is well to sling him at once. But, if the paralysis is complete, it is better to allow the animal to remain down, turning him over from one side to the other every six hours. But after the first paroxysms are over and the animal shows an inclination to rise, it is then well to sling him, only allowing him to remain up for a short time, and then letting him down and increasing the time he remains in the slings according to his strength. The use of liniments, sinapisms and stimulating applications to any part of the body should be avoided; if the legs below the knees and hocks become cold, hand-rubbing and the application of a red flannel bandage should be used.

If the animal is weak and presents great prostration, then the administration of stimulants every hour in the form of alcohol, one-half ounce, and quinine sulphate, one drachm, will be found to give good results. Should the animal show improvement after the third or fourth day, use iodide of potassæ in one drachm doses every six hours in his drinking water, and the usual carbonate of ammonia ball with an increase of pulverized nux vomicæ given three times a day. The ball may be made up as follows:

Carbonate of Ammonia	2 ounces,
Camphoræ Pulverized	1 ounce,
Nux Vomicæ "	1½ ounces,
Gentianæ Rad. "	2 ounces,

and sufficient honey to make a mass and make eight balls.

As improvement continues the food should be increased and the amount of stimulant medicines decreased, and care should be taken not to put the horse to work too early.

The Electric Elevated Railway in St. Louis.

THE railway committee of the St. Louis City Council will report in favor of the elevated electric railway bill, and there is now a fair prospect of its becoming a law during the present year. The route of the road is from Grand avenue and Arsenal, eastward to Seventh street, Seventh to Howard, Howard to Broadway, Broadway to Salisbury, Salisbury to Palm, and Palm to the Fair Grounds. Only the provisions of the bill are now under consideration. An elevated electric railway is an accepted fact, as far as the committee is concerned at least.

A New Use for Street-Railways.

THE Metropolitan Street-Car Company, of Atlanta, Ga., is breaking a lot Texas ponies by making them pull street-cars. This is an excellent way to break bucking ponies, and it also affords infinite amusement to the passengers. A passenger gets aboard of the car, and is not in any particular hurry about arriving at his destination; a regular Mazeppian steed is hitched to the car, and all along the line there are stoppages and lots of fun. All this any citizen can get for the small amount of five cents.

Inspecting Cable Roads.

THE Boston board of aldermen, who are to report on a system of rapid transit for their city, have inspected the cable railways of Philadelphia and New York, and also the cable line on the Brooklyn Bridge.

STREET-RAILWAY NOTES.

THE construction of the electric motor cars to be furnished by the Van De Poel Company for use on the Minneapolis street-railways is being rapidly finished. These cars will be lighted by electricity, and furnished with electric brakes.

NEW BRUNSWICK, N. J., has never had a street-railway, but in a sudden attack of enterprise the aldermen of the city have recently granted franchises to several newly-organized street-railway companies.

THE Citizens' Street-Railway Company, of Elkhart, Ind., has received a franchise. The Knights of Labor secured a clause requiring hours and wages to be agreed upon by an arbitrator.

THE Mount Vernon, (N. Y.) New Rochelle and Yonkers Surface Railroad Company has been granted a franchise by the Mount Vernon board of trustees.

THE National Motor Company has been incorporated at Chicago, with a capital stock of $250,000, to manufacture street-railway motors.

THE Evanston (Ill.) Street-Railway Company has been incorporated to operate lines by horse and cable traction. Capital stock, $150,000.

IN the department of New Inventions of this month's JOURNAL will be found the description of an improved heater for street-cars.

AN application has been made for a charter for the Pittsburgh (Pa.) Elevated Railway Company, with a capital stock of $50,000.

SCHENECTADY, N. Y., is to have a new street-railway. The capital stock is to be $50,000 and the route five miles long.

A FRANCHISE has been granted for the construction of a street-railway in Newburg, N. Y.

New Inventions.

Vogel's Railway Telegraph.

WILLIAM VOGEL, of Chicago, Ill., is the inventor of an improved system of telegraphing or telephoning between railway-stations to moving cars, which is herewith illustrated and described. The object of the invention is to provide a means for sending telegraphic and telephonic

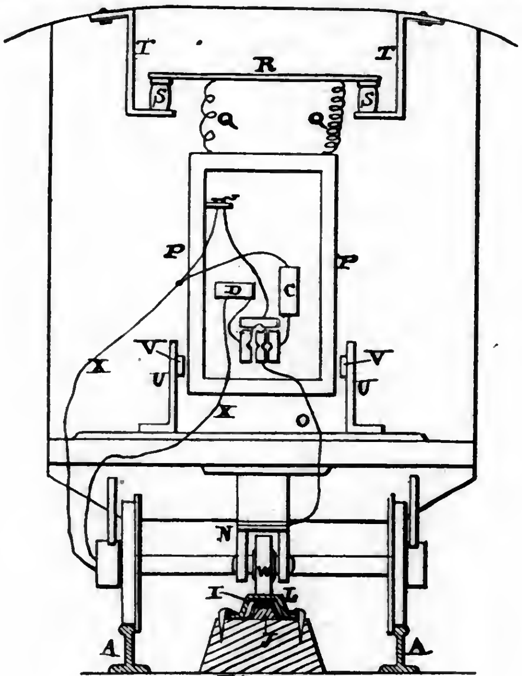


Fig. 1.

VOGEL'S RAILWAY TELEGRAPH.

messages to trains at a distance from the station, whether the trains are stationary or in full motion, and so to construct the receiving-chamber that the noise of the moving train will be deadened, so as not to interfere with the operator in sending and receiving messages.

In the accompanying cuts, Fig. 1 is a vertical cross-section taken through the car and the railway-track, showing the electrical connection between the station and the car; Fig. 2 a longitudinal section of the car, taken at

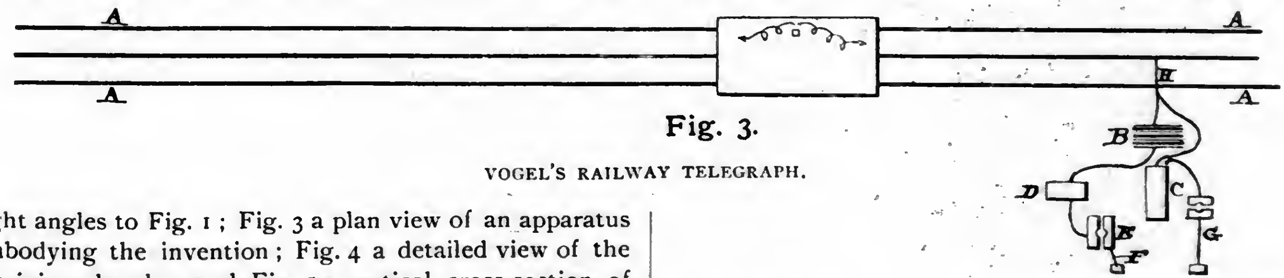


Fig. 3.

VOGEL'S RAILWAY TELEGRAPH.

right angles to Fig. 1; Fig. 3 a plan view of an apparatus embodying the invention; Fig. 4 a detailed view of the receiving-chamber, and Fig. 5 a vertical cross-section of the wire, its bed and covering.

A represents the rails of the main railway-track; B the battery placed at the station; C the telephone; D a telegraph apparatus; E the switch, and F G the ground lines. The battery is connected with the wire I, by the wire H, which wire I, extends along the track between the two main rails. Along the main track in between the two rails, is placed, upon any suitable base or support, the bearing J, of any suitable shape, size or construction, and upon the top of which is placed any insulating compound or material. Upon this support J, is placed the copper wire I, and over the top of the support J, and the wire is placed a cap-piece L, which is in contact with the wire, and which serves as a conductor between the wire and

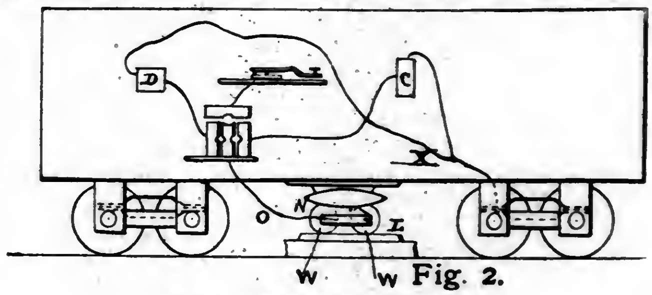


Fig. 2.

VOGEL'S RAILWAY TELEGRAPH.

the wheels of the truck. This cap L, is spiked or otherwise secured in position in any suitable manner.

Secured to the under side of the receiving-car is the truck N, which is provided with one or more wheels which bear against the cap-piece L, in between the rails of the main track. This truck is here shown as provided with two wheels and a suitable spring, but any suitable construction will answer. The truck is insulated from the car, but is electrically connected to a telephonic or

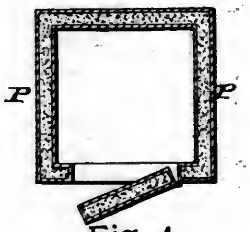


Fig. 4.

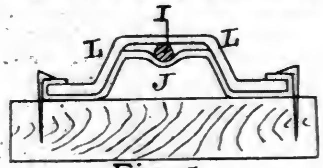


Fig. 5.

VOGEL'S RAILWAY TELEGRAPH.

telegraphic apparatus, the same as at the station, by means of the wires O.

In the receiving-car is placed the receiving-chamber P, which is of any suitable shape or size, and which is suspended by means of the spring Q, from the cross-bar R, which is supported in turn upon springs S, which are placed upon the brackets T, which project down from the roof of the car. The springs S, may be formed of rubber or any suitable material that may be preferred. The lower end of the chamber P, does not extend down to the floor of the car, but is raised a suitable distance above it, and is prevented from swaying back and forth by means of brackets U, which are provided with rubber springs V, upon their inner sides. The walls of the chamber are made double and packed with any suitable material for the purpose of deadening the sound and preventing the noise of the moving train from interfering with the operator in sending or receiving messages.

As before stated, the telephonic and telegraphic appara-

tuses employed in the receiving-chamber are the same as used at the station. The current passes through the battery-wire I, and through the wire to the covering L, placed over it. Where the train is either in motion or at rest upon the track, the current passes through the covering L, the wheels W, of the truck, through the wire O, to the switch, and then either the telegraphic apparatus or the telephone, as may be desired. The return current passes through the wire X, to the car-wheels, and from thence into the ground. The telegraph operator, seated in the receiving-chamber P, can freely send and receive messages either upon the telephonic or telegraphic apparatus, as desired.

This system of railway telegraphy is claimed by the inventor to be simple and reliable. It is now entirely controlled by Adolph Zeller, of Chicago, Ill., to whom the patent-rights have been assigned.

McAllister's Car-Coupling.

SANDERS F. MCALLISTER, of San Marcos, Tex., is the inventor of an improved form of car-coupling, which is herewith illustrated and described. In this coupling the central opening of the draw-bar is formed with a tup-bar having rearwardly a spiral-spring. The forward end of this tup-bar is inclined forward somewhat at an angle at the top, so that when the bar is pushed forward by the spiral-spring at its rear end, the coupling-pin will rest upon this forwardly-projecting end of the bar, while the link will rest beneath, so that in dropping the pin will rest within the link, and not on the outer side, which would be the case if this bar were square. The coupling-pin is manipulated by a series of bars and levers as is customary with devices of this kind.

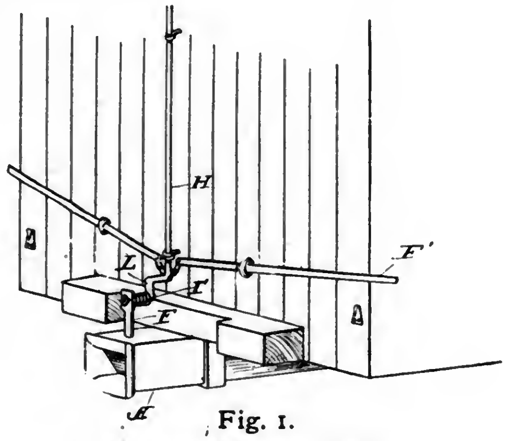


Fig. 1.
MC ALLISTER'S CAR-COUPLING.

In the accompanying cuts, Fig. 1 is a perspective view of an ordinary freight-car provided with the improved car-coupling, and Figs. 2 and 3 central sectional views of a pair of couplings.

A represents an ordinary draw-bar, wherein the usual opening B, centrally is somewhat elongated preferably within the draw-bar. Within this opening B, is provided a tup-bar or bolt C, of such a size as to operate freely backward and forward therein. Between this tup-bar C, and the rearwardly-vertical end of the opening B, is provided a spiral-spring D, which is designed to force the tup-bar C, forward past the opening E, having therein the usual coupling-pin F. The tup-bar C, is designed to project forward, by the action of the spriug D, far enough so that when the link G, is not in the draw-bar, as shown in Fig. 3, the pin F, may be raised by means of a system of levers F′, connecting with a vertical bar H, having at its lower end a right-angled projecting part I, provided thereon with a spiral-spring I′. The upper end of the coupling-pin is designed to be secured to the forward end of the angled projection of the vertical bar, and held in place by the spiral-spring I′, pressing against the nut at the end of the angled portion, so that no strain may be produced on the vertical bar when the draw-bar is drawn either back-

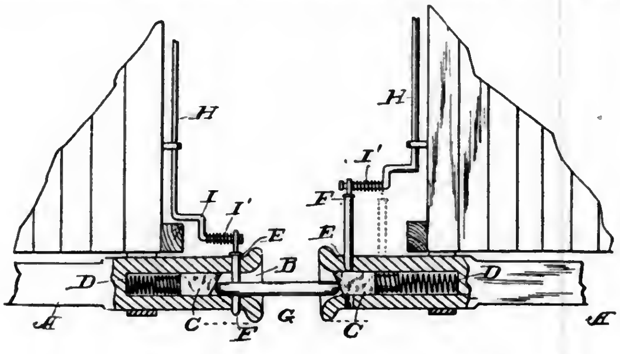


Fig. 2. Fig. 3.
MC ALLISTER'S CAR-COUPLING.

ward or forward. The forward end of the tup-bar C, is designed to be at such an angle that when the link is coupled, as shown in Fig. 2, the tup-bar C, is pushed rearwardly far enough to permit of the pin F, dropping down forward of the bar and securing the link in position.

The operation of the device is very simple, consisting in connecting one end of the link with a draw-bar, as shown in Fig. 2. The pin, in connection with the tup-bar C, holds the link G, horizontally. Then the pin F, of the opposite draw-bar is raised, permitting the tup-bar C, to move forward by the action of the spring D. which holds the pin in position above the draw-bar. The contact of the link G, in coupling, forces the tup-bar C, as shown in Fig. 3, rearwardly a sufficient distance to allow of the pin F, dropping down within the link G.

This form of coupling is claimed by the inventor to be simple, durable and efficient, and it can be attached to any car at small expense.

Hunter's Street-Car Heater.

FREEMAN S. HUNTER, of Fort Ritner, Ind., is the inventor of an improved heating device for street-cars, which is herewith illustrated and described. The invention consists in a car-heater constructed with heating-drums supported in a case held to the car-floor below an opening therein, and with a slatted guard held above the heating-drums to protect them from water or dirt which may fall through a grating fitted to the car-floor above the guard and drums, which latter have draft-openings at one end and connect at the other end with smoke-flues passing through the floor and roof of the car.

In the accompanying cuts, Fig. 1 is a sectional plan view of an ordinary street-railway car with the improved heater applied, and with the grating and guards of the heater removed; Fig. 2 an enlarged cross-sectional ele-

vation of the lower part of the car and the heater with the grating and guards of the heater in place; Fig. 3 a perspective view of one of the heating-drums, and Fig. 4 a plan view of a portion of the grating-cover of the heater.

A is the body of an ordinary street-car, which has the usual end platforms *a a*, sliding doors B B, and longitudinally-ranging side-seats C C. Along the center of the floor *b*, of the car, an opening D, is made which, as shown, extends for quite the whole length of the car-body; and below the opening D, is fixed the lower case E, of the heater, which is made with double side-walls *e e*, stayed by suitable bolts e', and converging to a central point or line as at e^2, this case also having close and double-walled ends fitted closely to the car-floor at the ends of the opening D, so that admission of air through or around the case E, to the interior of the car is prevented to avoid drafts, and any suitable non-conductor of heat may be packed between the walls *e e*, of the case E, to prevent radiation of heat from the drums F, through the case to

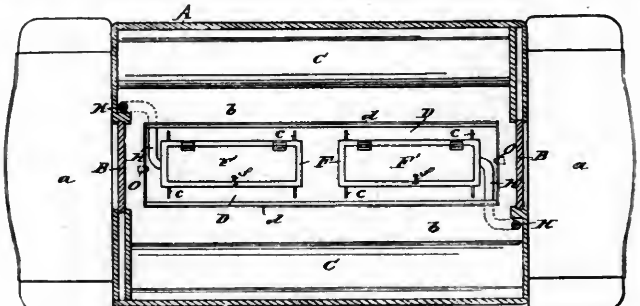


Fig. 1.

HUNTER'S STREET-CAR HEATER.

the outer air. The heating-drums F, are supported in the case and above its bottom by the cross-stays or brackets *c*, fixed to the case. The cuts represent two heating-drums F F, supported in the case E, as it is preferable to use two small drums, which may more easily be handled than a single long drum, and the two drums provide for better regulation of the heat with changing temperatures, as a fire may be made in either drum or in both drums, as may be required. In "bobtail" and other short cars, a single drum will be found sufficient.

As seen best in Figs. 2 and 3, the drums F, consist of elongated cases made, preferably, in cylindrical general form, and having a part or section F', hinged to the main body of the drum to form a cover, which may be opened to place the fuel *g*, into the drum and upon a loose grate G, supported near the bottom of the drum on cleats or flanges fixed to the drum, and any suitable hook and pin or other fastening, as at *f*, may be used to hold the cover F, closed. Draft-openings f', are provided at one end of the heating-drum with an apertured draft-regulating slide f^2, over them, and a pipe or flue H, leads from its other end, and is preferably turned to one side, so that it may pass upward through the car at a point alongside of the car-door, as in Fig. 1, and extend to and above the car-roof, to carry off the gaseous products of combustion from the fuel in the drum; and comparatively smokeless fuel—such as charcoal or coke—is used to avoid excessive discharge of smoke or gases into the car or public highway. A wire screen is placed around the pipe H, to prevent burning of the hands in passing in and out of the car. Rabbets *d d*, are found at the opposite side edges of the floor-opening D, in which the grating-cover I, of the heater-case E, may be supported with its upper surface flush with the car-floor. The grating I, may be made in one or more sections, as desired, and the grating is hinged at *i*, to the floor, so that it may readily be swung back for access to the heating-drums F, when required for renewing the fuel or making adjustments or repairs.

To the under side of the grating I, is attached, by means of suitable side-braces or arms K K, and it may be the center-braces *k*, also, the shield or guard L, which consists of a series of plates or slats *l*, connected to ribs or frame-bars *m*, and at suitable distances apart vertically to

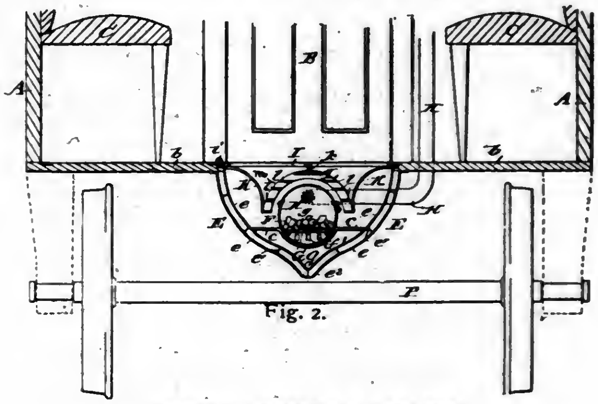


Fig. 2.

HUNTER'S STREET-CAR HEATER.

allow free rise of the heat from the drums through the slat-guard and grating to the interior of the car; and the slats *l*, of the guard L, are arranged edgewise relative to each other, so that any water passing through the grating I, onto the upper slats *l*, will be caught by the lower slats and conducted to the casing E, at the sides of the heating-drums, whereby the drums will be protected from the water or dirt dropping from the feet, clothing, or umbrellas of the passengers, and disagreeable odors from the heating apparatus are prevented. The drip-water may be emptied from the casing E, at any time by drawing the plugs O, from their holes in the ends or bottom of the casing, or

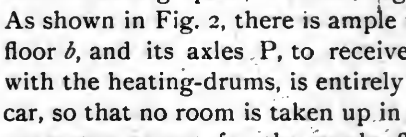


Fig. 3.

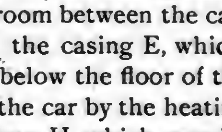


Fig. 4.

HUNTER'S STREET-CAR HEATER.

by opening any suitable valves similarly located. By connecting the guard L, with the grating I, the guard will be swung upward on the hinges *i*, with the grating. As shown in Fig. 2, there is ample room between the car-floor *b*, and its axles P, to receive the casing E, which, with the heating-drums, is entirely below the floor of the car, so that no room is taken up in the car by the heating apparatus except for the smoke-flues H, which require very little space.

It will be seen that this improved heater may easily be applied to old cars by simply cutting a hole through the floor at D, and attaching the casing E, having drums F, and the grating and guard I L, and fitting the pipes H, to the drums through the car-roof and floor; and with this heater it is claimed that a car may be warmed quickly, comfortably and economically.

De Mier's Electric Alarm-Signal for Railway-Cars.

John R. De Mier, of Las Cruces, N. M., is the inventor of an improved electric alarm-signal for railway-cars, which is herewith illustrated and described.* The invention comprises an electric battery with two conducting-wires running through the cars of a train to the locomotive, these wires being charged by the battery and forming an open circuit; alarm-bells or gongs on the locomotive and on each car; suitable circuit-closers to be operated by the conductor; circuit-closers operated by the disconnecting of cars and circuit-closers operated by the the car-trucks, and all of these circuit-closers operating the gongs and giving notice to the engineer upon the locomotive whenever required. The object of the invention is to enable the conductor of a train to communicate instantly and surely with the engineer at any time during a trip; and automatically to notify the engineer and conductor of any accident that may happen to any of the cars during the trip—as, for instance, the uncoupling of a car or the derailment of a truck.

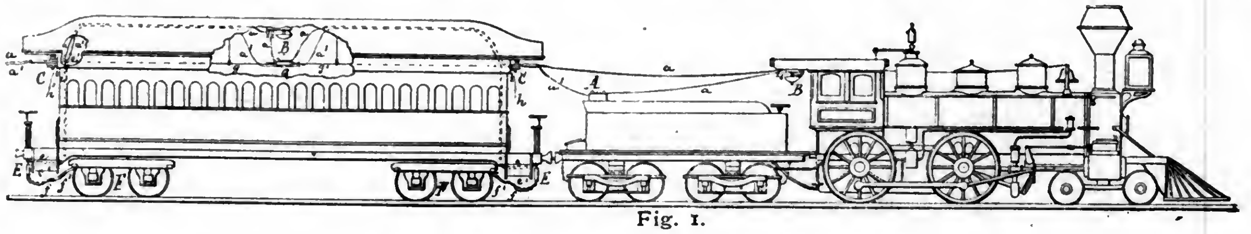


Fig. 1.

DE MIER'S ELECTRIC ALARM-SIGNAL FOR RAILWAY-CARS.

In the accompanying cuts, Fig. 1 is an elevation of a train, consisting of a locomotive, tender and a car, provided with the invention, certain portions of the car being broken away in order to show the invention more clearly; Fig. 2 a top view of one of the car binding-posts and circuit-closers; Fig. 3 an elevation of the same; Fig. 4 a bottom view of the removable part of the same; Fig. 5 a vertical longitudinal central section of the circuit-closer of the train-conductor; Fig. 6 a central horizontal section of the same; Fig. 7 a central vertical section of a truck circuit-closer; Fig. 8 an elevation of one of the electric gongs; Fig. 9 a diagram of an electric conductor used between the cars, and Fig. 10 a diagram of the alarm mechanism used by the train-conductor.

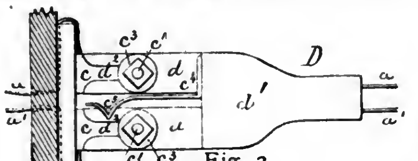


Fig. 2.

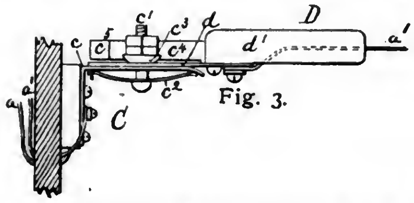


Fig. 3.

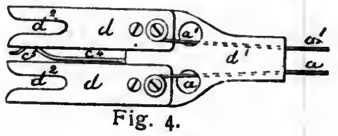


Fig. 4.

DE MIER'S ELECTRIC ALARM-SIGNAL FOR RAILWAY-CARS.

A represents an ordinary electric battery securely fastened to the tender or the locomotive. From this battery the positive conducting-wire a, runs to the engineer's gong B, of the locomotive, from there to the next car, through the gong B, of this car, and so on. The negative wire a, of the battery runs from it through the several cars of the train. The electric gong B, is of ordinary construction and consists of a gong-bell b, horse-shoe magnet b', armature-arm b^2, carrying a bell-hammer b^3, and two binding-posts b^4, connected by a wire b^5, with the coils of the horse-shoe magnet. At each end of the car suitable binding-posts C, are provided, which consists of two angular conducting-plates c, suitably insulated, which plates are provided with bolts c', spring-washers c^2, and unyielding washers c^3, with conical rims. Between the washers c^3, and plates c, the connecting-plates d, of the wire connections D, are inserted and securely screwed down with the bolts c', as seen in Fig. 3. These connections D, consist of a non-conducting handle d', through which the wires a a', pass lengthwise, and the two connecting-plates d, to which the wires are secured in a suitable manner. The ends of the connecting-plates d, are forked by means of longitudinal slots d^2, into which slots the bolts c', of the angular plates c, enter when the connection with the wires a a', and the car is made, and whereby any lateral displacement of the connection is prevented. One of the plates c, is provided with an elastic tongue c^4, having a curved or V-shaped end c^5, and this V-shaped end, in its normal position, is held behind and in range of the conducting-washer c^3, of the contiguous plate c, without touching either the plate or the washer.

If by accident or purposely the car is detached from its train, the connections D, and binding-posts C, become detached; but before being quite separated the V-shaped ends c^5, touch the washers c^3, of the contiguous binding-posts and establish a momentary closed circuit, whereby the magnets of the gong of every car between the closed connection and the battery, including the magnet of the locomotive-gong, become momentarily charged and attract their armatures to which the bell-hammers are attached and cause them to strike one blow, thus giving the alarm to the engineer and to the conductor, if the latter is in a car connected with the train. When the V-shaped ends c^5, leave their respective washers c^3, the electric circuit is again broken, so the conductor's circuit-closers G, can be operated ahead of the detached car. In establishing the electric connection of a car coupled to a train, the wires a a', are provided with one connection D, at each end, and one of the connections is inserted into the binding-post C, of the forward car by pushing the forked plates d, between the washers c^3, and plates c, and then drawing tight the bolts c'. The same operation is repeated with the rearward car, and the two cars are then electrically connected. In practice these electric connections or couplings D, will be kept in a suitable store-room

ready for use, and are only attached to cars when a train is formed, and a surplus number of them, wherewith to meet emergencies, are also kept in the store-room. The entrance of the plates d, between the washers c^3, and plates c, is facilitated by the conical form of the washer-rims, and the use of bolts c', and spring-washers c^2, insures a better hold on the connections than the ordinary binding-post without the spring-washers, inasmuch as the loosening effects of the jolts of a running car upon the screws are counteracted by the constant tension of the spring-washers, and the screws remain undisturbed.

To provide an alarm in cases of accident to a car-truck, a circuit-closer E, is attached between the bottom of the car and the truck, and connected by means of two conducting-wires e e' with the wires a a', respectively. This circuit-closer E, consists of a serrated conducting-blade e^2, suitably suspended from the bottom of the car, and connected by means of the wire e, to the wire a, and also of a block e^3, firmly enclosing the blade e^2, attached by means of a chain f, to an arm f', of the truck F, this block e^3, having a conducting-spring e^4, attached to one of its sides, which spring is, by means of the conducting-

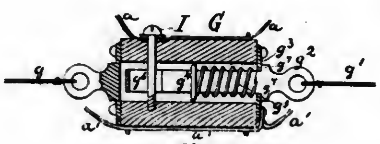


Fig. 5.

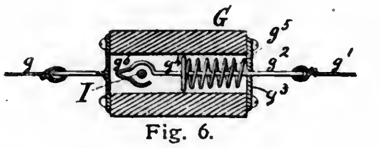


Fig. 6.

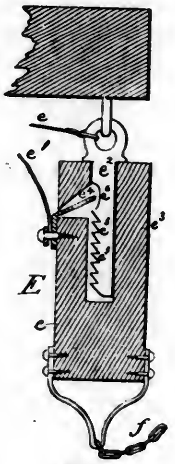


Fig. 7.

DE MIER'S ELECTRIC ALARM-SIGNAL FOR RAILWAY-CARS.

wire e', connected to the wire a'. The end of the spring e^4, is in range of the serrations e^5, of the blade e^2, and by means of a sufficiently large notch e^6, in the blade is prevented from touching it under ordinary circumstances, the friction between the blade e^2, and block e^3, being sufficient to prevent their separation while the truck is running on the track. When the truck becomes derailed, or accidentally moved sidewise from the track, the wheels at one side of the track run upon the ground outside of the track on diagonal or curved lines, while the wheels at the other side of the truck run over or upon the sleepers of the track, whereby the truck is caused to oscillate about its center pin to an extraordinary extent, and thus the chain f, is jerked from its normal position and the block e^3, becomes detached from the blade e^2, and as this takes place the spring e^4, is pulled over the serrations of the blade e^2, and every time it passes over and touches one of its points it establishes a closed circuit, the effect of which is one blow of every bell-hammer against its gong from the truck to the locomotive. By the number of blows given the engineer knows the nature of the accident, and accordingly stops the train in order to avoid greater damage. The train-conductor's circuit-closer consists of a non-conducting barrel or cylinder G, suspended between two cords g g', in the middle of the car. These cords pass through the ends of the car, and through two eye-bolts h h', suitably fastened above the doorways. Below these eye-bolts, pendent handles h^2 h^3, are fastened to the cords, whereby the cords are pulled, and are prevented from being pulled out of the eye-bolts. The cord g, is fastened directly to the barrel G, and the cord g', is fastened to a conducting spring-bolt g^2, in the barrel. This spring-bolt g^2, passes through a head-plate g^3, of the barrel, and is provided with a disk g^4, therein, and between this head-plate and disk a tension-spring g^5, is inserted, which keeps the curved end g^6, of the spring-bolt g^2, away from a transverse conducting-pin or screw I, in the barrel. An outer shoulder g^7, on the spring-bolt g^2, rests against the head-plate g^3, and thus limits the forward stroke of the bolt. The wire a, is connected with

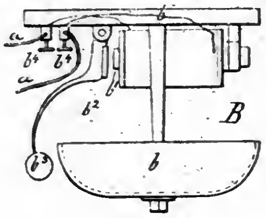


Fig. 8.

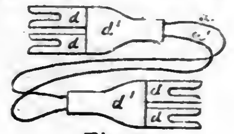


Fig. 9.

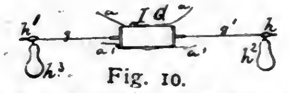


Fig. 10.

DE MIER'S ELECTRIC ALARM-SIGNAL FOR RAILWAY-CARS.

the bolt g^2, by being fastened to the conducting-plate g^8. From the screw I, the wire a, passes through the gong B, and then to the end of the car, as before stated. When the conductor pulls one of the cords, either inside or outside of the car, the bolt g^2, is pulled from the barrel until its curved end comes in contact with the conducting-screw I, whereby a closed circuit is established, causing the usual alarm or blow on the electric gong in the car whose circuit is closed and all cars forward, and on the locomotive, and as the conductor releases the cord the circuit is broken again, preventing wastage of battery. The conductor by a variety of signals—*i. e.*, different numbers of blows—can communicate his orders to the engineer, but he should not use the alarm-signals of the connections D and E.

This device is claimed to be simple and reliable, and can readily be attached to railway-cars at comparatively small expense.

Campbell's Snow-Sweeper.

NEIL CAMPBELL, of Brooklyn, N. Y., is the inventor of an improved snow-sweeper for railways, which is herewith illustrated and described. The invention is covered by four patents taken out by the Brooklyn Railway Supply Company, to whom the entire patent-rights have been assigned. Two of these patents cover the snow-sweeper, one the draw-bar mechanism, and one the journal-box, and each will be described separately.

In the accompanying cuts, Figs. 1 to 3, inclusive, refer to the sweeper as covered by one patent. This invention relates more particularly to a special construction of the revolving brooms employed in snow-sweepers and analogous machinery, whereby the brooms are made in a cheap and rapid manner and at the time very strong and durable,

while they may also be repaired at any time with ease and dispatch.

Fig. 1 is a longitudinal section of the improved broom, a portion being broken out from the middle; Fig. 2 an interior view of one of the broom-heads, showing at X Y Z certain portions in section on the lines *x x*, *y y* and *z z*, respectively, and Fig. 3 a plan view of a portion of a broom-head and of the parts carried thereby.

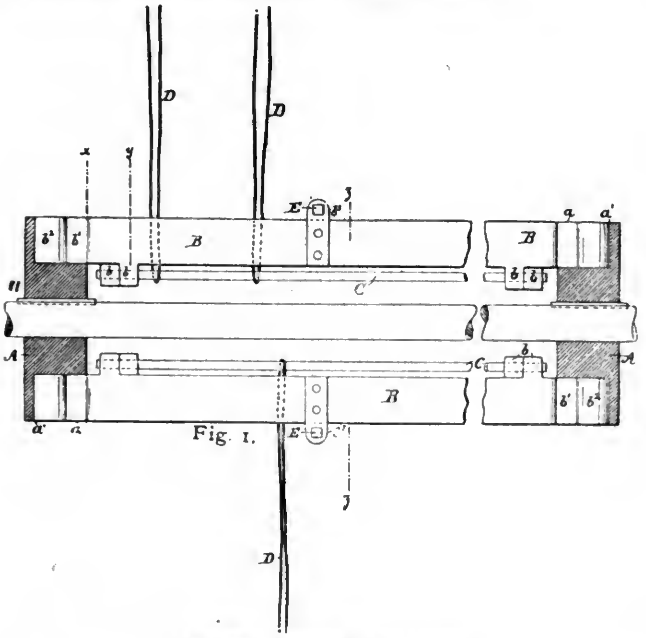


Fig. 1.

CAMPBELL'S SNOW-SWEEPER.

Two broom-heads A, are employed, keyed upon the broom-shaft at such distance from each other as the length of the broom which it is desired to form dictates. Each head A, is formed with a series of radial sockets *a*, the sockets in one head facing those in the other, and each socket *a*, terminates at its bottom—that is to say, near the outer face of the broom-head—in a cylindrical socket *a'*,

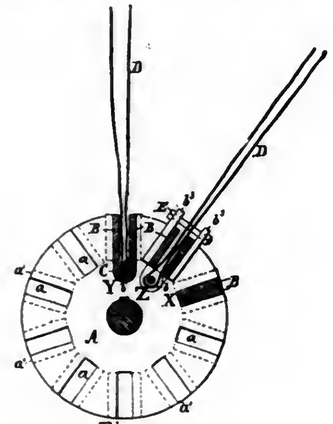


Fig. 2.

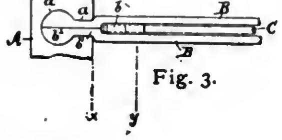


Fig. 3.

CAMPBELL'S SNOW-SWEEPER.

of larger diameter than the width of the socket *a*, as shown in Figs. 2 and 3. Between the broom-heads and parallel to the shaft extend stout bars B, hinged together in pairs by means of lugs *b*, and the rod C. The ends of these bars are so shaped, as shown at b' b^2, that when folded they will fit into the sockets *a a'*, in the heads A, all of the bars B, being of course of the same length, so that there are as many pairs of hinged bars connecting the heads as there are sockets in one of the heads. The whisks or sweeping-splints D, only a few of which are shown in the cuts, are bent at about mid-length and pushed over the rod C, and between the bars B, while the latter are open, until a sufficient quantity of whisks is thus hooked to a rod C, and confined between its bars B, when the latter are folded and secured in the folded position by means of bolts E, passing through lugs b^3, secured to or formed on the bars B. One pair of bars B, with their rod C, and whisks D, are termed a "broom-section." The section, prepared as described, is then placed in position by its ends being received in the sockets in the broom-heads A. It will of course be understood that the number of sockets in the heads A, and consequently the number of sections which go to make up a broom, may be varied within certain limits, and it will also be seen that the number of lugs *b*, and bolts E, and consequently the number of hinges and locking means provided for each section, may be varied according to the length of broom to be formed. In most cases the friction between the parts will alone be sufficient to keep the broom-sections in place in the heads A. If, however, this should in any case be

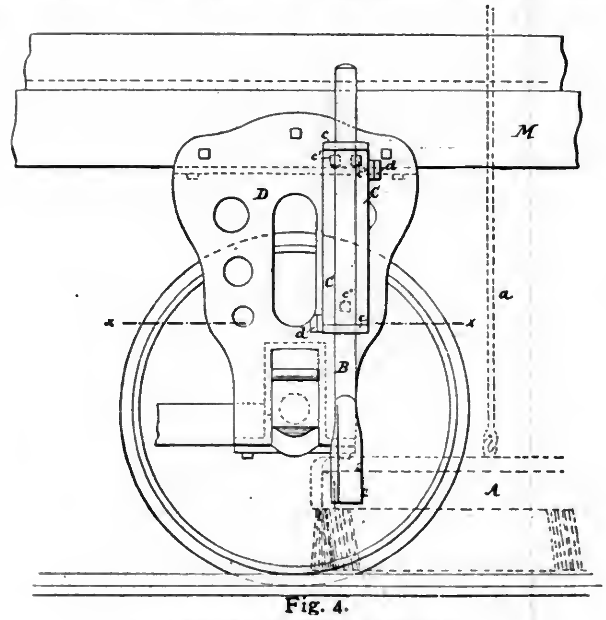


Fig. 4.

CAMPBELL'S SNOW-SWEEPER.

thought to be insufficient, a light ring or hoop may be slipped upon the head A, so as to cover the enlarged parts b' b^2, of the sections, thus holding them against any accidental displacement.

Figs. 4 and 5 refer to the sweeper as covered by the second patent. This invention relates to such machines in which relatively stationary oblique brooms are employed, either alone or preferably in connection with rotary sweepers, and its object is to prevent undue strains upon the bolts which serve to hold the broom-supports to the frame-work, and particularly to the pedestals.

Fig. 4 is an elevation of the novel parts, with so much of the ordinary parts as is necessary to indicate their relation thereto, and Fig. 5 a horizontal section on the line *x x* in Fig. 4.

The obliquely-placed broom A, which is shown only in part in dotted lines in the cuts, is secured at its outer end to a stout bar B, which is capable of sliding in the lugs *c* projecting from the piece C. The inner end of the broom (not represented) may be similarly connected. Means

are provided for raising and lowering the broom, as indicated by the rod *a*, which may be connected to suitable lever mechanism arranged upon the frame or platform M.

It will be seen that when the machine is moving in the direction from the left toward the right, the broom pushing against the snow and removing it from the track in a lateral direction, a very considerable strain or thrust is thereby exerted upon the broom, which thrust is of course transmitted through the bar B, to the piece C, so that if bolts alone are relied upon for securing the piece to the

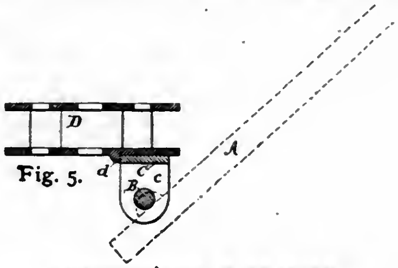


Fig. 5.

CAMPBELL'S SNOW-SWEEPER.

pedestal these bolts must be used in great numbers to prevent their being sheared off by the thrust or being loosened by the jars. In order to avoid these difficulties the pedestal D, is cast with raised portions to receive the sides of the piece C, against their lateral faces, thus receiving the entire thrust that may at any time be exerted through the broom upon the piece C. In this manner the entire resistance which is offered to the broom is transmitted to the heavy strong casting forming the pedestal,

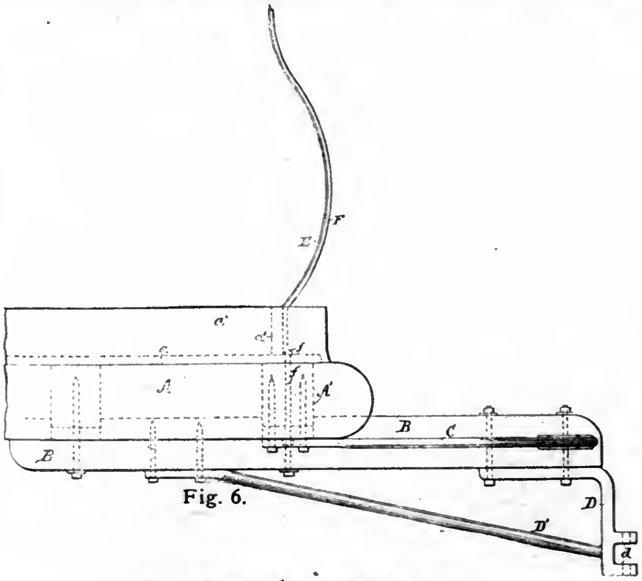


Fig. 6.

CAMPBELL'S SNOW-SWEEPER.

and through it to the frame M. The bolts *c'*, which according to this construction serve only to hold the piece C, up to its place in the recesses formed by the face of the pedestal and the projections *d*, may therefore be only few in number and comparatively light.

Figs. 6 and 7 refer to the draw-bar employed upon the snow-sweepers. This device is more particularly adapted to that class of machines in which obliquely-placed revolving brooms are employed. It relates to the construction of the end portions of the sweepers, and consists in a peculiar construction of braces, whereby not only great rigidity of the parts is secured, but considerable space gained, so that the proper working of the brooms in throwing the snow forward and sidewise is insured. The rigidity of the dash-board is also increased by an improved construction of the stiffening-ribs.

Fig. 6 is a side elevation of one end of a snow-sweeper, and Fig. 7 a plan of the same on a smaller scale.

A is the frame of the sweeper. It is covered with a floor *a*, having a raised rim of boards *a'*. B is the draft-bar, formed of a stout piece of wood bolted to the cross-beams of the frame A, in the center line of the machine. This draft-bar extends forward a considerable distance beyond the end cross-beam A', and requires, therefore, to be braced strongly against lateral strains. This is effected by means of the curved iron bars C, which have their rear ends firmly bolted to the sides of the frame A, while their front ends bent backward apply against the sides of the bar B, and are firmly bolted thereto, as shown.

The horses are attached to the machine by means of suitable eveners at *d*, which are projections from the L-shaped piece D, one arm of which is bolted to the draft-bar B, the other arm, carrying the projections, being braced by the iron bar D', the rear end of which is bolted to the draft-bar B, as shown.

Fig. 7 shows in peculiarly dotted lines the position of

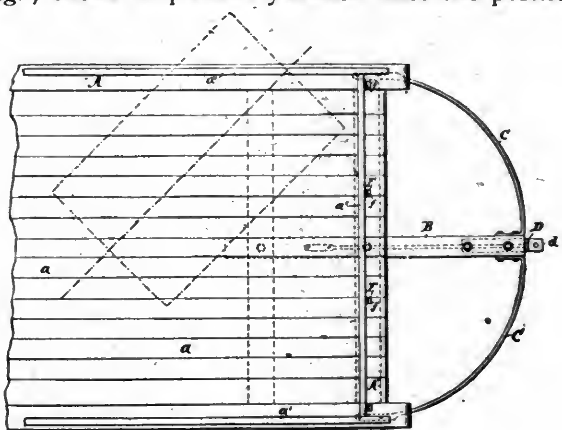


Fig. 7.

CAMPBELL'S SNOW-SWEEPER.

the revolving broom. When the machine is moving from the left to the right, the snow will be thrown forward from the broom, the latter revolving in a direction opposite to the running wheels. In certain circumstances it is important that the snow shall be thrown well forward, and yet that it shall be somewhat confined. For this purpose curtains are sometimes attached to the braces C, depending to a greater or less distance from the ground. It will now be seen that these braces C, when provided with curtains, offer a much larger space into which the snow may be thrown than if they were made to extend in straight lines, and their curved shape must therefore be considered quite an important element.

The dash-board E, rises from the raised front rim *a'*. It is preferably made of thin sheet-iron strengthened by wrought iron ribs F. These latter are made to extend down to the floor *a*, thus serving also to hold the rim-board *a'*, in a vertical position. These ribs F, at the point where they reach the floor *a*, are formed with broadened seats *f*, from which extend the shanks *f'*, passing clear through the end cross-beam A, and being secured on the under side thereof by means of nuts, as shown. This construction affords a very strong and reliable support for the dash-board.

Figs. 8 to 11, inclusive, refer to the journal-box for the

snow-sweepers. This journal-box may be advantageously employed for receiving that end of the broom-shaft which is remote from the driving mechanism. The improved box is a single casting and forms not only the bearing for the shaft but has a grease-box, means for attaching the lifting-rod and a lug formed with an eye, whereby it is guided upon a vertically-extending bar.

Fig. 8 is a longitudinal section; Fig. 9 an end view seen from the side on which the shaft enters; Fig. 10 an end view seen from the opposite side, and Fig. 11 a plan view.

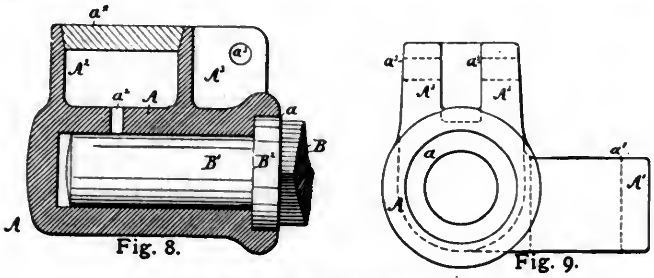


Fig. 8. Fig. 9.

CAMPBELL'S SNOW-SWEEPER.

The main body A, of the box is formed with the hole or bore for receiving the end or journal B′, of the broom-shaft B. At the mouth of the bore is an enlarged portion *a*, into which is fitted the collar or flange B^2, of the shaft B. This arrangement not only tends to prevent the entrance of dust and other foreign bodies to the journal B, proper, but also retards to some extent the loss of lubricating material, in case such material should have been supplied too liberally.

From the main body A, projects in a lateral direction the lug A′, having a hole *a′*, which when the box is put in place upon the machine receives a guiding-rod to guide the box in its upward and downward movements. Above the main body A, is formed a grease-box A^2, which does not, however, extend the extire length of the casting. It

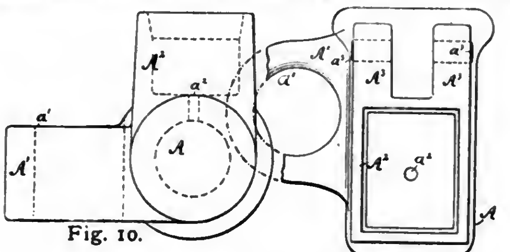


Fig. 10. Fig. 11.

CAMPBELL'S SNOW-SWEEPER.

communicates through one or more holes a^2, with the interior of the main body, whereby the journal is kept properly supplied with lubricating material. A suitable quantity of the latter is placed in the box A^2, which is then preferably closed by a cover a^*. The sides of the box A^2, are extended forward and considerably thickened, as shown at A^3, forming lugs between which may be received the opening-bar (not shown) by which the box may be raised and lowered on the sweeper. The bar is preferably pivoted to the lugs A^3, by a pin (not shown) extending through the holes a^3.

Snow-sweepers constructed as above described, and with the various devices mentioned, are claimed to perform their work reliably and satisfactorily. The machines are simple in construction and not liable to derangement.

Taggart's Car-Coupling.

Frank J. Taggart, of Adrian, Mich., is the inventor of an improved form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a vertically longitudinal section of the device, showing the draw-bar in position after it has entered the draw-head and is coupled, dotted lines showing the position to uncouple; Fig. 2 an end view, and Fig. 3 a vertical cross-section on the line *x x* in Fig. 1.

A is the draw-head, provided with the rectangular mouth *a*, having outwardly beveled or flaring edges *a′*. A′ is a shoulder on the inner lower side of the mouth *a*, with which the draw-bar engages to effect the coupling. B is a partition or buffer-head extending down nearly to

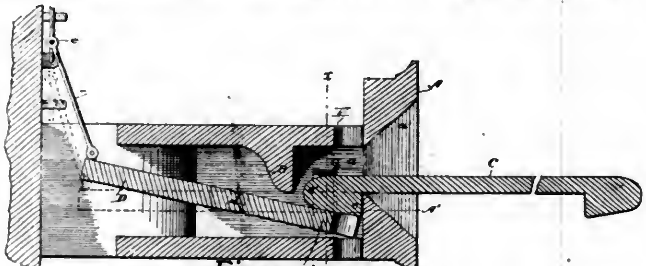


Fig. 1.

TAGGART'S CAR-COUPLING.

the bottom of the inside of the draw-head, its lower edge being in a plane with the upper edge of the shoulder A′. Against this partition the draw-bar strikes when it enters the draw-head. C is the draw-bar, having shoulders *c*, and pointed or rounded ends *c′*.

As the cars come together the pointed end of the draw-bar strikes against the beveled edges of the mouth *a*, and is guided into the mouth, the draw-bar being so placed that the shoulders *c*, are on its under side, the weight of the draw-bar causing it to drop down as it enters the draw-head, and one of the shoulders *c*, engages with the shoulder A′, and couples the cars, the partition B, limiting the distance the draw-bar enters the draw-head.

D is a releasing-lever fulcrumed at *d*, and having the

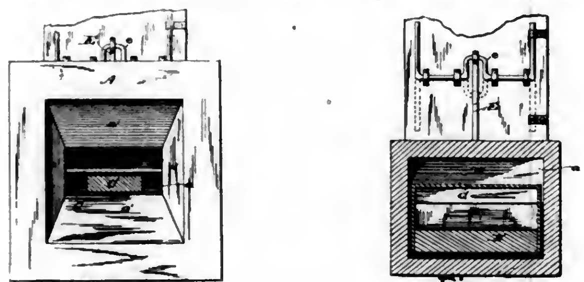


Fig. 2. Fig. 3.

TAGGART'S CAR-COUPLING.

arm D′, projecting under the partition B, and completely filling the bottom of the outer end of the draw-head. When this lever is raised, its upper side is in a plane with the upper edge of the shoulder A′, as shown in dotted lines in Fig. 1, The inner arm of the lever is connected by a rod E, with the crank-arm *e*, by means of which the lever is operated. The crank-arm is secured to the end of the car, and any suitable device may be used for locking it so as to hold the lever in any desired position.

When it is desired to uncouple the cars, the crank is turned down, forcing the inner end of the lever down and raising the arm D′, which lifts the draw-bar and releases it

from engagement with the shoulder A', and uncouples the cars.

G is a metal retaining-strap secured to the outer end of the lever D, and when this outer end is lowered the strap engages with the top of the draw-bar and prevents it from getting out of position. This strap also serves to hold the draw-bar in position to enter the draw-head of an approaching car, and by raising or lowering the lever the draw-bar can be given the proper pitch. The beveled edges of the mouth of the draw-head permit the draw-bar to enter the mouth of the draw-head of an approaching car at any angle. This is a great advantage, especially in coupling cars in which the draw-heads are in different planes. If desired, instead of the retaining-strap a movable jaw secured by suitable guides to the top of the inner sides of the draw-head and operated by a spring may be used, the spring forcing the jaw down on top of the draw-bar.

H is a pin-hole in which a pin can be inserted when it is necessary to couple with a car using the old style of link-and-pin coupler, A pin-hole can also be made in either end of the draw-bar, as shown in dotted lines. It will thus be seen that with this invention the operation of coupling and uncoupling can be effected without going between the cars, as it is only necessary to turn the crank to place the draw-bar in position to couple or uncouple.

The inventor claims that this form of coupling is simple, durable and efficient, and can be readily attached to any form of car at small expense,

Pitcher's Spark-Arrester.

JOHN M. PITCHER, of Sugar Creek, Ind., is the inventor of an improved spark-arrester for use on locomotives, stationary or portable engines, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a side view of a boiler with the device attached; Fig. 2 a vertical cross-section of Fig. 1, on the line X X, and Figs. 3 and 4 represent modifications of the spark-arrester, in sectional view, as applied in Fig. 1.

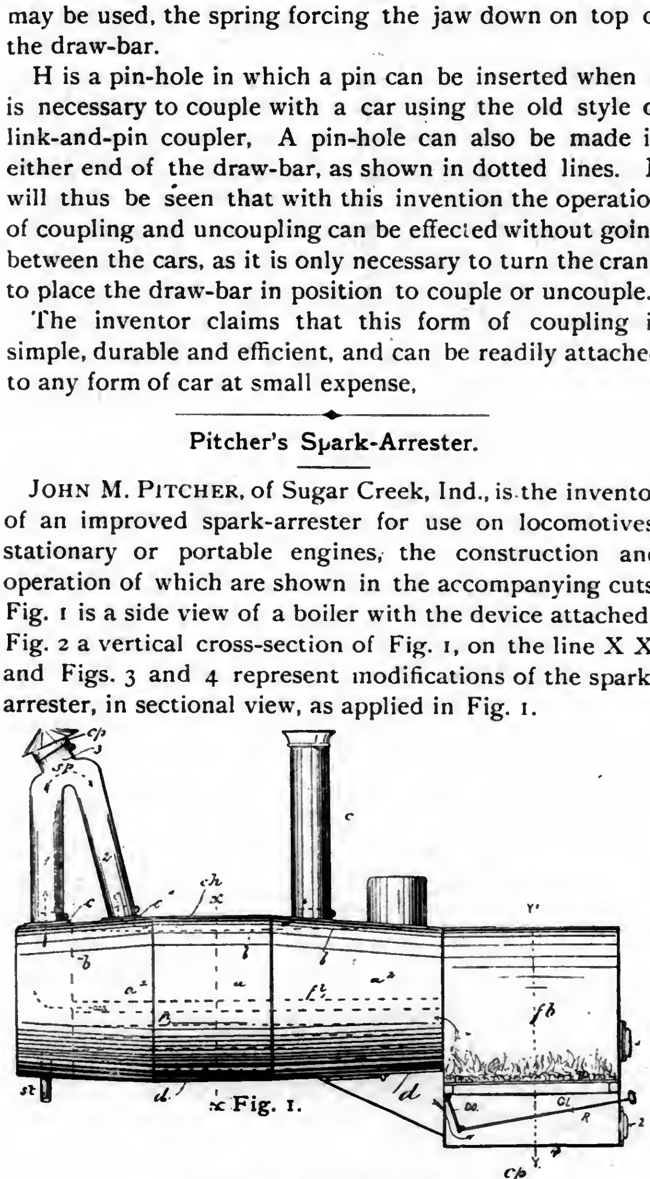


Fig. 1.

PITCHER'S SPARK-ARRESTER.

In Fig. 1, *b* indicates in dotted lines the boiler, with the ordinary fire-box *fb*, bridging *bb*, and flues *fl*. *a* is a drum or jacket, constructed of sheet or boiler-iron, of any desired strength, and made in three sections. The central section *a*, is a plain cylinder. The two end sections *a'* and a^2, are conical. These sections are firmly riveted together to form a steam-tight casing around the boiler, when attached thereto at the two ends, as indicated in the cuts, and supported by a suitable frame. C is a collar attached to the boiler over the bridging-chamber *bb*, and C' is a collar attached to the top of the section *a'* of the drum *d*, to receive the spark-arrester *sp*, which consists of three-sections of pipe, 1, 2 and 3. Section 1 of this pipe fits over the collar C, and receives the sparks and smoke from the bridging-chamber *bb*, as indicated by the arrows, discharging the same into section 2 of the arrester, through which the sparks and smoke pass and discharge

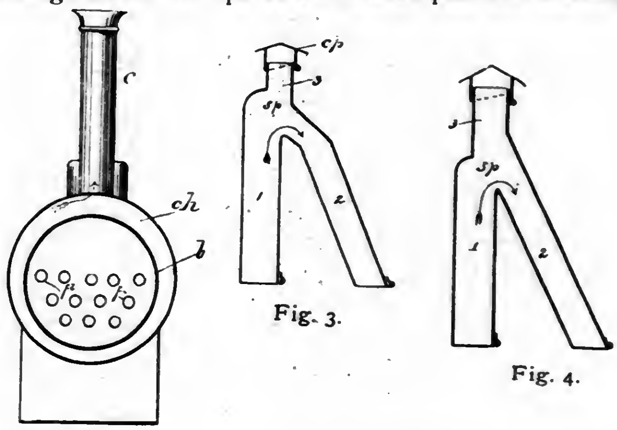


Fig. 2. Fig. 3. Fig. 4.

PITCHER'S SPARK-ARRESTER.

into the chamber *ch*. Sections 1 and 2 of the spark-arrester may be connected at the upper ends, as indicated in Figs. 1, 2 and 3. In either case a discharge-pipe 3, is so arranged that one-half thereof extends over the ascending section 1, and the other half over the descending section 2, of the spark-arrester, as shown. *cp* is a cap made to fit over the top of section 3, provided with a hinge, by means of which it is opened and closed at will. *c* is a smoke-stack attached to section a^2, of the drum *d*, and communicating with the chamber *ch*. *st* is an exhaust-steam pipe through which steam or air is injected into the bridging-chamber *bb*. The chamber *ch*, is so adjusted as to leave a larger space above than below the boiler, as indicated in Fig. 2.

The ascending section of the spark-arrester *sp*, is placed over and perpendicular to the bridging-chamber *bb*, and joined to the descending-section 2, at the upper end. Section 2 inclines downward and connects with the chamber *ch*, of the drum *d*. Sections 1 and 2 connect with section 3, which is so arranged as to project half over the ascending and half over the descending sections, and is provided with a hinged cap *cp*, which can be opened and closed at will. The space between sections 1 and 2 of the spark-arrester is covered by a concave sheet, as shown in Figs. 3 and 4.

The method of operating the device is as follows: Before firing up, the cap *cp*, is opened, which allows the smoke to issue through section 3 of the arrester. When sufficient steam has generated to set the machinery in motion, the cap *cp*, is closed and the exhaust-steam is injected into the chamber *bb*, through the steam-pipe *st*, creating a draft, which forces the smoke and sparks up through section 1 of the spark arrester, down through section 2, and into the chamber *ch*, as indicated by the arrows.

It is claimed by the inventor that his device is simple in construction and reliable in action, and that by its use a considerable economy in fuel is effected.

Ries' Automatic Alarm, Signaling and Safety Devices for Railways.

ELIAS E. RIES, of Baltimore, Md., is the inventor of an improved alarm signaling and safety system for railways, which is herewith illustrated and described. The invention is designed not only to promote safety in the running of trains by giving automatic warning to the engineer in case of danger of any kind on the track ahead of him, and by bringing his train to a standstill if the warning signal or signals are disobeyed, but also to prevent injury to persons or property at road-crossings and other points by giving early and positive warning of its approach. Briefly stated, the objects of the invention are as follows: First, to give warning of the approach of a train to persons at road-crossings, stations and curves, by means of the usual whistle signals, given automatically at a uniform distance from such points; second, to give warning to the engineer himself in case of danger ahead from a misplaced switch, open drawbridge, or similar cause, in the event of his failing to notice and obey the ordinary visible signals usually placed at such points; and third, to stop the train automatically by cutting off the steam supply and applying the brakes, in case the engineer, through disability, negligence or other cause, allows the train to proceed after being warned by an audible "misplaced switch" or "open drawbridge" signal to bring his train under control.

In order to carry out these objects, each locomotive is provided with an automatic signaling mechanism arranged to give upon the locomotive whistle any desired one of a code of audible signals, and the mechanism is operated to give these several signals by means of inclined planes of corresponding different heights arranged at the proper points along the railway. The crossing and station inclines are fixed, but the switch and drawbridge, as well as the train-stopping inclines, are movable or pivoted, and so arranged that upon opening the switch or draw the inclines will be brought into a position to enable the contact-wheel on the engine to ascend them and operate the signaling mechanism.

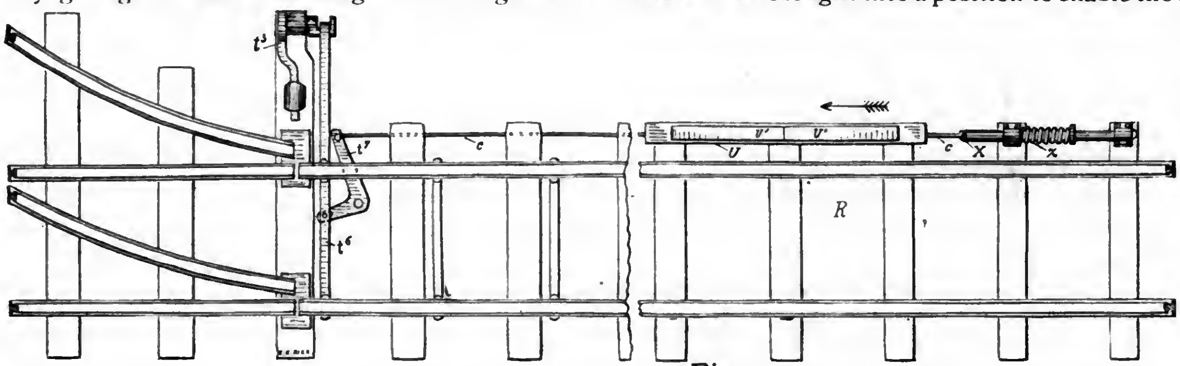


Fig. 1.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

In the accompanying cuts, Fig. 1 is a plan view of a railway switch, showing the movable switch-incline and the method of connecting it with the switch-rails; Fig. 2 a side elevation of the fixed crossing and station inclines; Fig. 3 a side elevation, with part of its casing removed, of the form of incline shown in Figs. 1 and 4; Fig. 4 a general view, in three parts, of a drawbridge with its approach, showing the distant, intermediate and train-stopping inclines and their operating mechanism; Fig. 5, a side elevation of a locomotive, giving a general view of the signal mechanism and train-stopping apparatus, and showing an incline alongside the track in an elevated position; Fig. 6 a front view, with the cover removed, of the signal machine carried on the locomotive, and Fig. 7 an end view of the same with part of the case removed. Fig. 8 is a detail view of the signal-wheels and a diagram of the respective signals given by them.

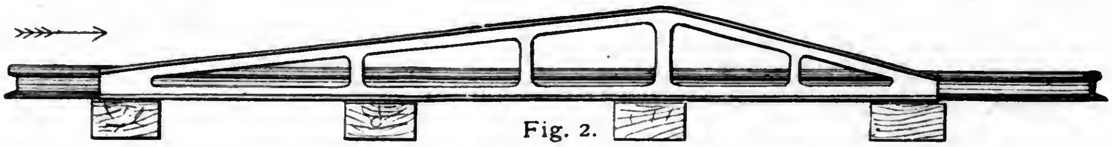


Fig. 2.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

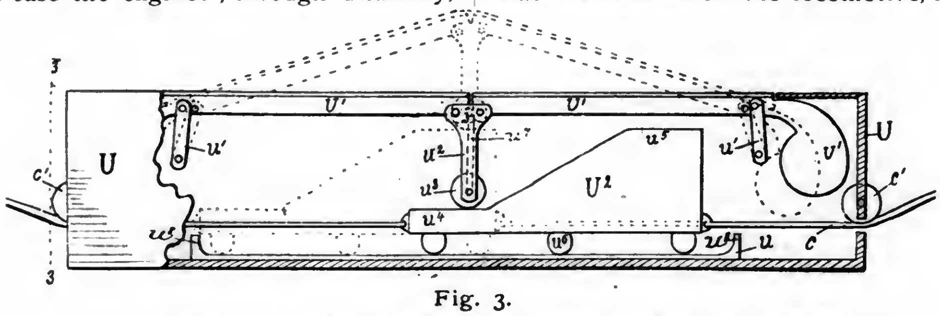


Fig. 3.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

Referring to Fig. 5, B is a vertically guided sliding-bar having a friction-roller C, at its lower extremity, its upper end being connected to the rack-bar of the signaling machine. A spiral-spring D, bears downwardly against a

collar E, on the sliding-bar, the downward movement of the bar being limited by the stop e^3, so that the wheel C, in its lowest position is nearly two inches above the rail surface, sufficient to enable it to clear all frogs, switch-rails, etc., along the line.

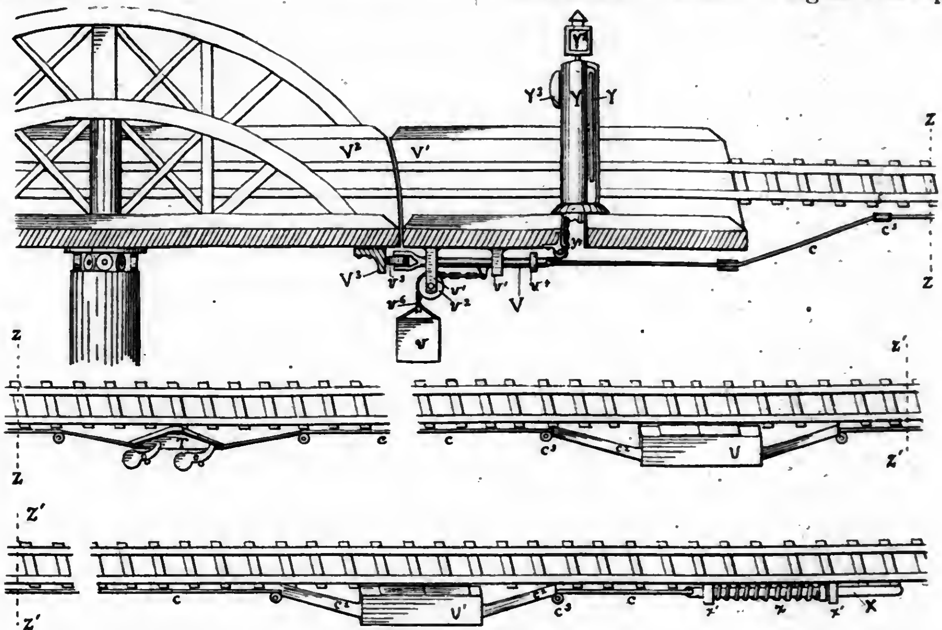


Fig. 4.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

ing the descent of the sliding bar to its normal position.

The signaling machine, shown in Figs. 6 and 7, is provided with five signal-wheels, J, J^1, J^2, J^3, J^4, shown in detail in Fig. 8, each of which is capable of giving upon the locomotive whistle a signal corresponding in form to the elevations and depressions on its periphery. These wheels are placed together on the same shaft, on which they are free to revolve. Above the signal-wheels, secured to the sleeve B^2, is the signal-lever L, whose outer end is connected with the whistle lever w. The rack-bar that

At a distance of 500 yards from each road-crossing and station, an incline of the kind shown in Fig. 2 is fixed, the crossing incline being six, and the station incline seven inches in height above the rail surface. When the roller C, and rod B, are lifted in passing over one of these in-

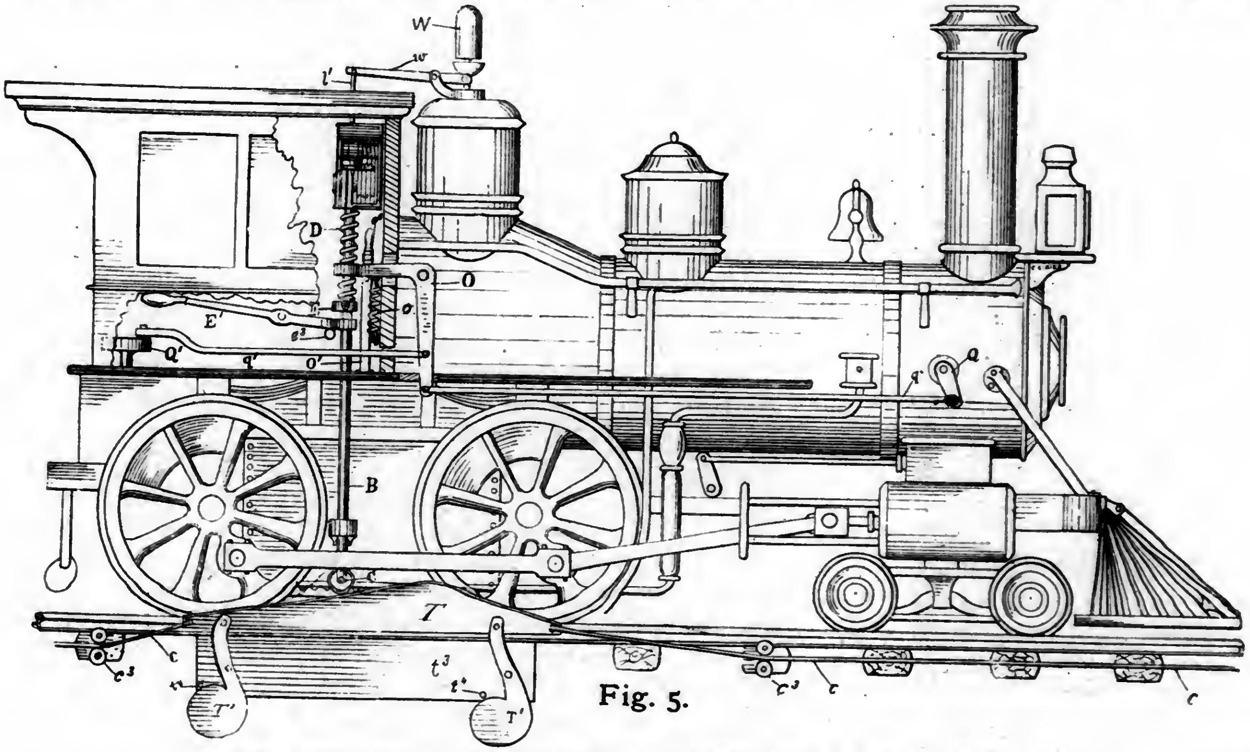


Fig. 5.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICE FOR RAILWAYS.

clines, the only mechanical work done is to compress the spring D. The signaling machine is operated, *after the wheel has left the incline*, by the action of the spring in expanding, the particular signal corresponding to the height of the incline being given upon the whistle dur-

enters the machine engages with a toothed pinion, which with the notched cam H, is keyed to the shaft supporting the signal-wheels. When the rack is lifted by a "crossing" incline, the pinion G, and cam H, will be revolved until they have made one revolution, whereupon the pawl h,

will fall into the notch *h′*, as shown, the signal-wheels meanwhile remaining quiet. The spring D, will now force the bar B, downward, revolving the pinion G, in the opposite direction, and with it the cam H, and the signal wheels. The elevations on the first wheel J, will now

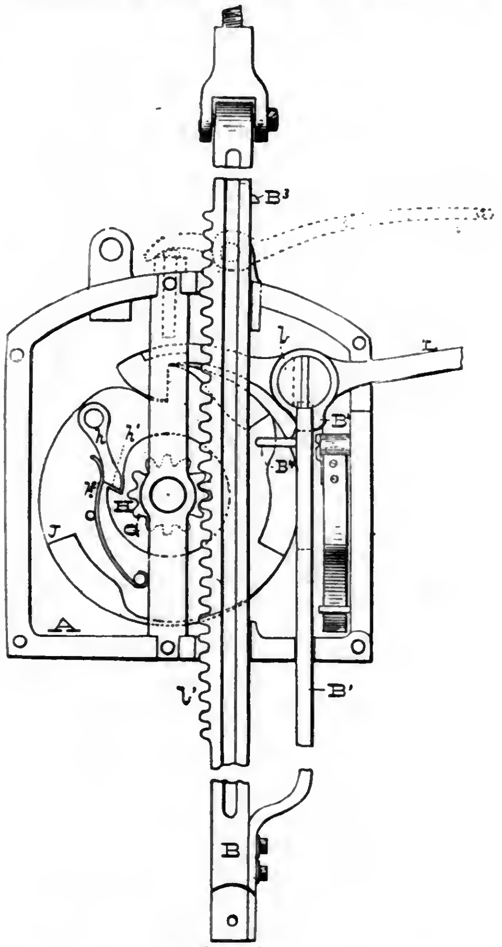


Fig. 6.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

successively elevate the inner end of the signal lever L, thus causing it to sound the "road-crossing" signal (two long blasts followed by two short blasts) upon the whistle W. The descent of the bar B, is regulated and rendered uniform by means of an air-cylinder, not shown in the cuts, whose piston-rod is attached to the upper end of the rack-bar B.

To the rack-bar B, is secured a transferring cam B′,

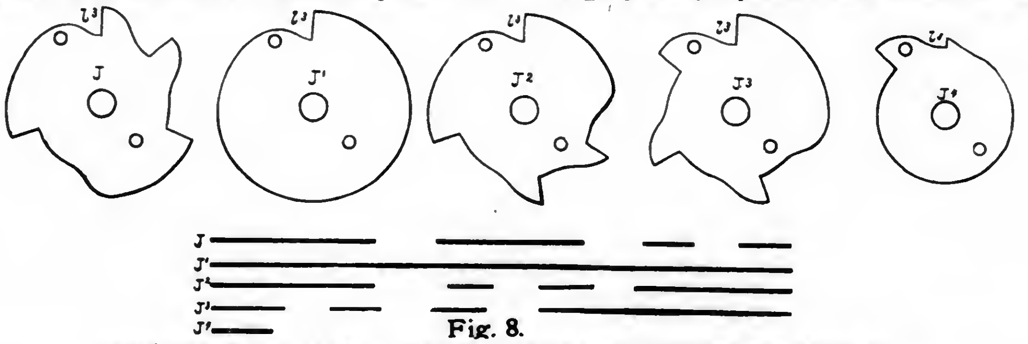


Fig. 8.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

having its upper end tapered on one side. When the sliding-bar is elevated by a "station" incline, the point of this wedge enters through a slot in the shaft *l*, and moves the sleeve B², forward until the signal-lever is over the second or "station" signal-wheel J′. The lever is held in this position, while the wheels are revolving, by one of the teeth of the lever N². Just before the revolution is completed, however, a pin B³, on the rack depresses a projection B⁴, of the lever N², and thereby releases the signal-lever, which, under the pressure of a spiral-spring on the shaft *l*, immediately resumes its normal position

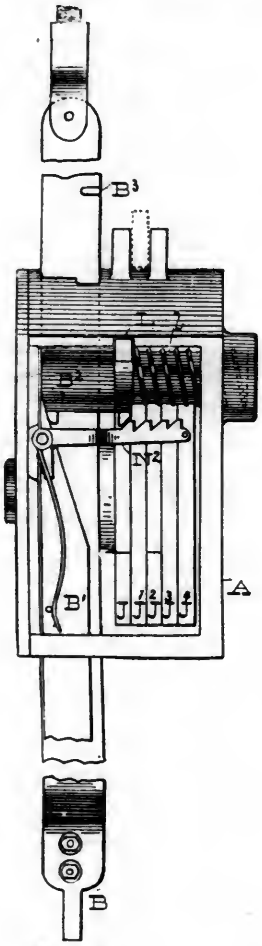


Fig. 7.

RIES' AUTOMATIC ALARM, SIGNALING AND SAFETY DEVICES FOR RAILWAYS.

over the wheel J. In this manner, for each additional inch that the sliding-bar is lifted above the first four inches necessary to a revolution of the signal-wheels, the signal-lever is moved to a corresponding different wheel.

Figs. 3 and 5 represent two forms of movable inclines for switches, drawbridges, etc., the former consisting of two counter-weighted arms U U′, capable of being elevated by a slight forward motion of the shoe U², in the enclosing case U, and the latter being arranged to move bodily

in a vertical plane, when the small wire connecting-cable c, is moved. When the inclines are elevated, their weight and the pressure of the sliding-bar B, is sustained by the shoe U^2, and the pins t^4 t^4, respectively, and ample provision is made to compensate for variations in the length of cable due to expansion or contraction.

Fig. 1 illustrates the track apparatus as applied to a switch. The case U, is embedded in the road-bed at a distance of 400 yards from the switch. The free end of the signal-wire c, that connects with the interior shoe U^2. —which in this instance faces in an opposite direction from that shown in Fig. 3—is attached to one arm of a bell-crank lever t^7, whose other arm is secured to the bar t^6, connecting with the switch-lever. When the switch-rails are at safety, as shown, the cable c, is drawn forward, and the actuating spring x, is compressed. If now the tension on the cable is relaxed by moving the switch to the siding, or if the cable should be accidently broken, the spring x, will draw forward the shoe U^2, and elevate the arms U U', to the proper height for giving a "misplaced switch" signal on the whistle of a passing locomotive. When the switch-rails are again moved to the main track, the shoe U^2, is drawn back, and the signal-arms descend to their normal position.

When the sliding-bar B, on the engine is lifted by a "down-brakes" incline, which is the highest of the series, the collar E, is raised sufficiently high to come in contact with and lift one arm of the bell-crank lever O, whose other arm is then operated by means of rods q and q', respectively, to cut off the supply of steam to the cylinders and apply the air, vacuum or other brakes to the train. The arm of the bell-crank lever O, is caught and retained in position by one of the teeth o^6, on the lever O', until released by the engineer.

It should be stated that the sliding-bar B, and the signaling and train-stopping apparatus on the locomotive are placed as shown in Fig. 5, in order to facilitate description, an entirely different arrangement being employed in practice.

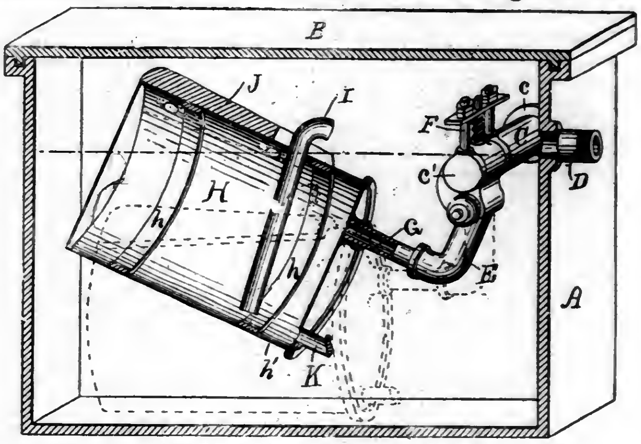
Fig. 4 shows a number of inclines operated by the same cable. An inclined guide-rail V^3, normally holds back the bar V, against the downward pull of the weight v. When the draw V^2, opens, the guide-rail V^3, gradually recedes and allows the weight v, to descend and elevate the alarm inclines. The operation of this system of signals is as follows: When a locomotive approaches an open drawbridge, it first comes to the distant incline U', which gives a "drawbridge" alarm upon the whistle, and is a signal to the engineer to continue at slower speed to the next incline. Should the draw be closed in the interval, the second incline U, will give no signal, and the engineer will continue his way unobstructed across the bridge. Should the draw, however, be still open, this incline will repeat the alarm on the whistle, upon which the engineer will come to a full stop before reaching the "down-brakes" incline T, within hearing and in view of the gong Y^3, and the home signal Y. The train will remain here until the bridge closes, whereupon the alarm-inclines descend, the signal-arm Y', and lamp Y^2, return to the "safety" point, and the gong Y^3, rings to call the engineer's attention to the fact that the track is clear, and that he may proceed. Should the engineer, however, fail to obey the warning signals of his whistle and continue past the intermediate incline U, without stopping, when the bridge is open, the train will be automatically stopped upon reaching the alarm-incline T, which, in the manner before described, shuts off the steam, puts on the brakes, and gives a "down-brakes" signal on the whistle W, of the locomotive.

From what has been said it will be seen that this system of signaling and safety devices can be applied to prevent accident and to facilitate the movement of trains in a number of other ways in addition to those described, and it is therefore unnecessary to dwell upon its particular advantages.

The invention is stated to be only the beginning of a new departure in methods of railway signaling, and a number of other applications are now pending before the Patent Office embracing several important improvements. The letters patent for the invention above described contain 75 claims, nearly all fundamental in their character, and patents have already been taken out in all the principal foreign countries. The apparatus has been and is still being thoroughly tested, with highly satisfactory results, on one of the Baltimore railways, and the inventor, a young mechanical and electrical engineer of Baltimore, expects very soon to have the system in practical daily operation. Any further information regarding this system can be obtained from the Ries Automatic Railway Signal and Safety System, A. H. Henderson, general manager, Baltimore, Md.

Newton's Steam-Trap.

ROBERT NEWTON, of Providence, R. I., is the inventor of an improved form of steam-trap, which is herewith illustrated and described. The device is of that class of steam-fixtures which are designed to discharge the water



NEWTON'S STEAM-TRAP.

of condensation without allowing any escape of steam; and the object of the invention is to increase the rapidity of action of this class of devices and to economize the amount of space required by the floating chamber; also, so to place the valve-chamber and the inlet that they shall be below the water-level, and thus produce a better lubrication of the valve and a more thorough separation of the liquid of condensatson from the steam.

The accompanying cut shows the device in longitudinal vertical section.

A is the tank or receptacle in which the water of condensation is collected, and in which the valve is operated.

B is the cover of the tank, C the tubular inlet, and D the outlet, the water-line being indicated by a broken line on a level with the outlet through which the water escapes, and by which the water-level is maintained. At one end the inlet C, extends through the side of the tank and carries a flange or shoulder *c*, between which and the inner surface of the side of the tank any suitable packing may be placed. The opposite end of the inlet is provided with a valve-chamber *c'*, to which a tubular elbow E, is movably attached. G designates a tubular arm or pipe which connects the elbow F, with the floating chamber H. This chamber is of cylindrical form, and is braced internally by two rings *h h*. The chamber is also provided with the small hole *h'*, through which the chamber is gradually filled. I is the discharge-pipe or vomit, J the weight for the chamber H, and K the drip-pipe, the outer end of which is closed by a valve *k*, which opens outwardly.

By the peculiar construction above described the inlet and its valve are submerged, and thus a more petfect discharge of the water of condensation is effected, while at the same time the valve is lubricated. When the water of condensation is to be discharged, it escapes through the pipes I and K, and hence a very rapid action is produced. The chamber H, by its cylindrical form, not only affords an opportunity for the use of the weight J, but occupies much less space than if formed otherwise. This chamber may be used with either the outlet I, or the outlet K, alone, and still maintain the advantage of rapid discharge.

The purpose of the weight J, is to steady the action of the chamber H, and in order to insure the proper action of the weight it is rendered adjustable upon the chamber by means of bolts which work through elongated slots in the weight, and by which the weight is secured to the chamber. The end of the weight is recessed so as to permit of the movements of the weight. These features are shown in the cut, and by them the action of the weight in facilitating the fall and retarding the rise of the chamber is properly regulated.

This device is now controlled by the Providence Steam-Trap Company, of Providence, R. I.

A BOILER has been made in France in which the metallic surface exposed to fire does not touch the water. The boiler, it is said, cannot become red hot, but is enveloped all over by the same temperature. The vaporization is very great, and the last drop of water can be converted into steam without any danger of explosion.

THE attention of the readers of the JOURNAL is directed to the advertisement of Mr. S. Davis' Safety Truck-Appliance, appearing in this issue. Mr. Davis' device appears to be receiving the unanimous endorsement of the Canadian press, and indications point to its early adoption by a number of leading railways.

General Offices THE ROTE AUTOMATIC BRAKE COMPANY,

Mansfield, Ohio, *November 3d, 1884.*

To the Westinghouse Air Brake Company, Pittsburgh, Pa.:

Gentlemen :—Understanding from your published announcements that you recommend your brake for freight-train use we respectfully invite you to a complete and searching public test of its merits in competition with the *Rote Automatic Brake* This test to be made in so complete and critical a manner as to show all the railroads of the country, as well as the Railroad Commissioners of the various States, which of the two brakes is the one which should be used ; for the test will, we are certain, leave no doubt in the minds of any witnessing it.

To insure the proper management of the test we suggest that you choose one person, we another, and these two a third person, all three to be well known as capable and honorable rolling-stock experts, to conduct the test, their expenses to be jointly borne by you and by us.

An invitation to witness the test to be extended to the General Officers of Railroads and all State Railroad Commissioners to the members of the National Car-Builders Association, and to the Railroad and daily press.

The test to be at such time and place as may be mutually agreed upon, but we suggest that the proper place would be on some road having high grades and sharp curves, so that both brakes may have as hard and complete a test as possible. As is necessary to make the test searching and complete, and as all railroads wish to increase the length of their trains and only wait for a brake which will enable them to do so, we think each train should be made up of 50, 60 or 70 cars, as you may prefer, or, if you think best, of even more cars.

Your company to supply your train and engines, we to supply ours.

The following points, among others, to be considered and reported upon :

Cost of equipping trains.

Simplicity.

Freedom from breakage.

Certainty of action.

Effectiveness.

Cost of maintaining.

"Flatting" of wheels.

Any other points submitted by you or by us in writing to be added to the above.

The brakes or trains are to be tested in every manner and under all conditions which practical railway service may suggest, including yard as well as line service.

Among others the following tests are to be applied to both trains :

1st.—Each train is to be (part of the time) run by engineers and crews who have never operated either brake and who are wholly unfamiliar with them.

2d.—The trains are (part of the time) to be partly made up (as nearly all freights are everywhere) of foreign cars, which have neither your nor our brake on, so that the cars having your break or ours on shall be widely and irregularly separated from each other.

3d.—The locomotives drawing your train and ours to be exchanged, from time to time, and draw each others trains.

4th.—Two locomotives equipped as so many freight engines and tenders are, with hand-brakes instead of steam or air brakes, are to be substituted for the two engines used in the test part of the time. Any brake which will not work properly if this is done, you will admit, can be of little practical value in actual service.

5th.—From time to time each train is to be stopped and foreign cars (not equipped with either your brake or ours) are to be run into it, at irregular intervals, just as actual service requires constantly.

6th.—In the making up of trains, etc., crews are to be exchanged at random, so that the test may fully illustrate the convenience of operating each kind of brake in actual ordinary service.

7th.—Frequent short runs, stops and quick starts are to be made.

8th.—A series of yard tests are to be made, showing the action, convenience, etc., of the two brakes.

We mention a few necessary tests only, and you and we, as well as the test committee, are to add any number of others, it being distinctly understood that if you decline any test proposed by us, or we decline any proposed by you, it shall be condered an explicit and positive admission of inferiority.

This rule must in every case be strictly observed, namely: *Both brakes must be tested in precisely the same manner*, so that there may not only be absolute fairness, but no room for suspicion even of anything else.

You have been in the brake field a long time, have profited justly and largely from the patronage of railroads, and we are sure will welcome this plan for allowing your patrons and the American public to judge for themselves which brake should come into universal use.

Having proper confidence in the merits of your brake we know you will gladly and promptly accept our proposition herein made, as you must feel that the test will be complete.

The railroad public is a very fair-minded, capable body, and will most horoughly appreciate and fully recognize the equity and fairness of our offer to you, and, in common with business-like people everywhere, will naturally (and, we are sure you will admit, properly) consider it a virtual confession of inferiority and a public admission that the Westinghouse Brake is inferior to the Rote Brake and that it is unfitted for general freight service, should you decline or neglect to avail yourselves of the proposition we make you herein.

Permit us to add in closing that we wish to express to you our desire to have this communication received in the spirit in which it is sent, and to have it express to you our wish for a full, fair and searching test of the two articles in the relative merits of which the railroad interest is *primary* and that of the owners even secondary. Respectfully,

THE ROTE AUTOMATIC BRAKE COMPANY,

Per M. D. Harter, President

INDISPENSABLE TO ALL INTERESTED IN RAILWAYS.

POOR'S MANUAL OF RAILROADS

For 1886.

The NINETEENTH Annual Number of this Standard Work will issue in June, 1886, enlarged with many new and interesting features. The work contains complete and exhaustive information concerning every Railway Company, Stock, Bonds, Debt, Earnings, Expenses, Dividends, Officers, Etc., Etc., Maps, Etc.

ROYAL OCTAVO, CLOTH, 1400 PAGES. PRICE, $6.00 PER COPY.

1. A List of Officials of every Railway Company in the United States, Canada, Mexico, Central and South America, West Indies, Great Britain, Etc.
2. A List of Officials of Street-Railroads (Tramways) in the same countries.
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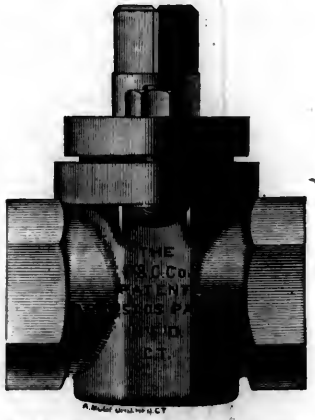

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In the event of Derailment, the Truck remains in its proper position with respect to the Car; and in the event of Broken Axles, the Truck-Frames are kept Parallel to the Car.

It can be applied to Freight-Cars of all kinds, to Passenger and Sleeping-Cars, and to Locomotives and Tenders.

The following extract appeared as an Editorial in the Montreal Daily Herald, of February 24th, 1886:

RAILWAY NEGLECT.

Now that railways have become a necessity to Canada, and that the traveling public are compelled to use them and to entrust their lives and property, nothing should be left undone to ensure to passengers absolute safety and unquestioned security. The railways should be as safe to travelers as money and inventive talent can by any possibility make them. But we all know they are not. We cannot take up a newspaper without reading of an accident of some kind, and many of these are due to defective rails, to cars jumping the track from one cause or another, upsetting, rolling down embankments, etc. The derailing of trains is heard of more frequently of late than formerly; but whether this is due to an increase in the number of such accidents, or to the more complete reporting of accidents in the newspapers of the present day, we are unable to say. It is sufficient to know that *preventable* accidents are happening, and this is just what the traveling public are not disposed to tolerate. There is a complaint, too—it proceeds, of course, from inventors and their friends—that railway managements are indisposed to adopt new devices for increasing the security extended to the public, even when they are not expensive. But railway men say, and very truly, that they are pestered almost to the verge of insanity by "inventors," with all sorts of whimsical contrivances, and that life would not be worth living if they were to seriously consider all the notions which inventors thrust upon their notice. There is of course much in what they say, and perhaps they ought to be sympathized with rather than criticized for neglecting so-called opportunities for enhancing the security to life on their railway properties. There was one invention, however, which, it was hoped, would have been taken advantage of by the Canadian railway authorities and utilized without unnecessary delay, as its practical working had been demonstrated to the satisfaction of the principal heads of the mechanical department in our leading railways. We refer to Mr. S. Davis' patent for preventing the derailment of cars, with consequent overturns and "smash-ups." A practical experiment demonstrating the utility and exceeding great value of this invention was made in the yard of the Canadian Pacific Railway, at Hochelaga, on the 27th July last, when cars traveling at the rate of fifteen to eighteen miles an hour passed safely over the track from which the irons had been removed, coming to a halt in about a car's length, with the trucks perfectly in line with the car-body; and in the case where one rail was removed, the wheels of one side of the car adhered to the remaining rail while the wheels on the opposite side passed over the earth and sleepers, mounted the rail at the end of the gap and proceeded on as if nothing had happened. The editor of the *Railway Age* came all the way from Chicago to witness the experiments, which were so successful as to leave nothing to be desired. The details of the invention need not be stated here; the invention itself is simple and comparatively inexpensive. What we wish to call attention to more particularly is the singular fact that although these experiments took place in July last, and the value of the invention in the interest of human life is unquestionable, nothing has been done to bring it into practical use on our Canadian railways. This is scarcely fair to the traveling public. If it were a doubtful experiment we could appreciate its delay; if it were a costly affair perhaps some excuse might reasonably be urged by poor corporations; but since neither of these is the fact it is hard to understand why so valuable an aid to the security of travel is not being utilized. Perhaps when some dreaful accident from the derailing of a train comes again to shock the Canadian public, and a railway company has been made to pay a heavy bill of damages for deaths and maimings, and suffered much loss of property, it will dawn upon our railway managers that they have achieved considerable loss of reputation and incurred heavy expenditures through their failure to avail themselves of a simple invention which is within the reach of the most impecunious railway corporation.

FURTHER ENDORSEMENT.

In dwelling upon a recent accident on the Northern Railway, at Thornhill, Ont., the Mont[illegible] Star, of March 3d, speaks as follows:

It occurred to Mr. S. Davis, of Montreal, that the tendency of railway-cars to run off the line might be stopped by limiting the turning capacity of the trucks to the extent of the greatest curvature of the railways. The maximum curvature is very slight and actual experiment has shown that cars constructed on this principle will not leave the rails under any circumstances. Mr. Davis has patented his invention. If the cars at Thornhill had been made on this principle they would not have left the track and consequently they would not have rolled down the embankment. If there is any good reason why this simple and cheap appliance should not come into general use for the prevention of such frequent and disastrous accidents it would be as well to make it known. Many lives and much money are lost every year by trains running off the track; if the accidents are, as they seem to be, preventable, somebody ought to be held to strict account for every such occurence.

A Full Illustrated Description of the Car-Truck appeared in the AMERICAN RAILROAD JOURNAL *for October, 1885.*

Full particulars will be furnished by addressing,

S. DAVIS,

P. O. Box, 447.

MONTREAL, CANADA.